DEPARTMENT OF THE INTERIOR
(INT FES 72-10)

FINAL ENVIRONMENTAL STATEMENT

HUNTINGTON CANYON GENERATING STATION AND TRANSMISSION LINE

PREPARED BY

DEPARTMENT OF THE INTERIOR
Bureau of Reclamation (Lead Agency)
Bureau of Land Management
Bureau of Sport Fisheries and Wildlife

DEPARTMENT OF AGRICULTURE
Forest Service

DEPARTMENT OF TRANSPORTATION
Federal Highway Administration

MAY 10 1972

Commissioner
Bureau of Reclamation

SUMMARY

( ) Draft (X) Final Environmental Statement

Department of the Interior
Bureau of Reclamation, Region 4; Bureau of Land Management, Utah State Office; Bureau of Sport Fisheries and Wildlife, Albuquerque, New Mexico
Department of Agriculture
Forest Service, Ogden, Utah
Department of Transportation
Federal Highway Administration, Salt Lake City, Utah

1. Type of action: (X) Administrative ( ) Legislative

2. Brief description of action: A coal-burning, thermal-electric generating station is under construction by Utah Power & Light Company in Emery County, Utah. The first 430-MW unit is scheduled for service in 1974, with a second unit tentatively planned for 1977. Ultimate capacity may reach 2,000-MW. A 345-KV transmission line has been constructed to a point near Salt Lake City, Utah, and to the Four Corners Area. Additional transmission capacity will be required for any units after the first 430-MW. Design for water and air quality control equipment will be subject to review by the Secretary of Interior under a proposed water supply contract to which the United States is a party, which will also require compliance with applicable standards.

3. Summary of environmental impacts and adverse environmental effects: Estimated stack emissions for a 430-MW unit include 33-45 t.p.d. of SO_2 (without controls, which will be installed when necessary and feasible to meet applicable State or Federal standards that may be established in the future); 36 t.p.d. NO_x; 0.9-1.4 t.p.d. particulates with 99.5% removal efficiency. Estimated stack emissions for 2,000-MW capacity include 31-42 t.p.d. of SO_2 (with 80% control to comply with tentative Utah Implementation Plan); 164-167 t.p.d. NO_x; and 4.2-6.0 t.p.d. of particulates with 99.5% removal efficiency. Other impacts: disposal of ash; noise, aesthetic impact; dust, possible radionuclide release, although preliminary studies indicate ambient concentrations will be far below USPH standards; some destruction of stream fishing, but enhancement of reservoir fishing and water-oriented recreation; loss of a small amount of big-game wintering areas, which will be mitigated partially by acquisition of other land and range improvements; some disturbance and displacement of vegetation and wildlife. Meteorological and modeling studies indicate that Federal and State air quality standards will not be exceeded, with the possible exception of short-term concentrations on high terrain.

4. Alternatives considered: No action; alternative locations; several smaller plants; curtailment of use of electrical energy; substitute fuels--nuclear, oil, gas, gasification of coal; geothermal resources.

5. Comments have been requested and received from the following: See attached list.

6. Date made available to CEQ and the public:
Draft statement: September 30, 1971
Final statement: MAY 10 1972

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TABLES:

LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS FROM WHOM COMMENTS REQUESTED AND RECEIVED

Department of Interior Agencies

* 1. Director, Bureau of Sport Fisheries and Wildlife, Washington, D.C.

2. Director, National Park Service, Washington, D.C.

* 3. Director, Bureau of Land Management, Washington, D.C.

* 4. Commissioner, Bureau of Indian Affairs, Washington, D.C.

* 5. Director, Bureau of Outdoor Recreation, Washington, D.C.

6. Director, Geological Survey, Washington, D.C.

* 7. Director, Bureau of Mines, Washington, D.C.

8. Regional Solicitor, Salt Lake City, Utah 84111

9. Secretary's Field Representative, Pacific Southwest Field Committee, San Francisco, California 94102

10. Southwest Planning Office, Interior Southwest Field Committee, Albuquerque, New Mexico 87101

Federal Agencies

* 1. Dr. T. C. Byerly, Assistant Director of Science and Education, Office of the Secretary, Department of Agriculture, Washington, D.C. 20250

* 2. Mr. Joseph J. DiNunno, Director, Office of Environmental Affairs, U.S. Atomic Energy Commission, Washington, D.C. 20545

* 3. Mr. Charles Fabrikant, Director of Impact Statements Office, Environmental Protection Agency, Washington, D.C. 20460

* 4. Mr. Frederick H. Warren, Commission's Advisor on Environmental Quality, Federal Power Commission, Washington, D.C. 20426

* 5. Mr. Roger O. Egeberg, Assistant Secretary for Health and Science Affairs, Department of Health, Education, and Welfare, Washington, D.C. 20202

6. Mr. Robert H. Baida, Regional Administrator IX, Department of Housing and Urban Development, San Francisco, California 94102

7. Dr. Francis Gartrell, Director of Environmental Research and Development, Chattanooga, Tennessee 37401

8. Hon. Michael S. Cafferty, Assistant Secretary for Environment and Urban Systems, Department of Transportation, Washington D.C. 20590

9. Mr. Paul DeFalco, Regional Director, S.W. Region, Environmental Protection Agency, San Francisco, California 94102

10. Dr. Sydney R. Galler, Deputy Assistant Secretary for Environmental Affairs, Department of Commerce, Washington, D.C. 20230

* 11. Mr. Ralph Gibson, Federal Highway Administration, Salt Lake City, Utah 84111

* 12. Advisory Council on Historic Preservation, Washington, D.C. 20240

13. Mr. W. H. Boley, Forest Supervisor, Manti-La Sal National Forest, Price, Utah 84501

14. Mr. Hugh Pangman, Forest Service, Department of Agriculture, Ogden, Utah 84401

15. Mr. G. O. Wessenauer, TVA, Chattanooga, Tennessee 37401

16. Mr. Lawrence D. Gazda, Environmental Protection Agency, Denver, Colorado 80202

17. Soil Conservation Service, Price, Utah 84501

18. Hon. Russell E. Train, Chairman, Council on Environmental Quality, Washington, D.C. 20006

State, County, and Local Entities

1. Planning Coordinator, Salt Lake City, Utah 84114

* 2. State of Utah, Department of Development Services

* 3. Mr. Henry Helland, Director, Utah Highway Department, Salt Lake City, Utah 84114

4. Mr. Daniel F. Lawrence, Director, Division of Water Resources, Department of Natural Resources, Salt Lake City, Utah 84114

5. Mr. Gordon B. Harmston, Utah Department of Natural Resources, Salt Lake City, Utah 84114

6. Mr. James G. Christensen, Division of Water Resources for Utah, Salt Lake City, Utah 84114

7. Mr. Joseph Francis, Chairman, State Department of Agriculture, Salt Lake City, Utah 84114

8. Dr. Grant S. Winn, Chief, Air Quality Section, Utah State Division of Health, Salt Lake City, Utah 84113

9. Mr. Lynn M. Thatcher, Director, Division of Health, Bureau of Environmental Health, Salt Lake City, Utah 84113

10. Mr. John Phelps, Director, Utah State Fish & Game Division, Department of Natural Resources, Salt Lake City, Utah 84116

11. Director, Utah State Parks & Recreation Division, Department of Natural Resources, Salt Lake City, Utah 84116

12. State Engineer, Santa Fe, New Mexico 87501

13. Mr. Larry J. Gordon, Environmental Services Division, State of New Mexico, Santa Fe, New Mexico 87501

14. Mr. Carter, State Department of Health, Environmental Services Division, Santa Fe, New Mexico 87501

15. Director, Environmental Improvement Agency, Santa Fe, New Mexico 87501

* 16. Mr. Myron B. Holburt, Chief Engineer, State of California, Colorado River Board of California, Los Angeles, California 90012

17. Mr. Joseph Palomba, Jr., Chief, Air Pollution Control, State of Colorado Department of Health, Denver, Colorado 80220

* 18. Mr. Fred Matter, P.E., Supervising P. H. Engineer, State of Colorado Department of Health, Denver, Colorado 80220

* 19. Mr. Wesley E. Steiner, Arizona Interstate Stream Commission, Phoenix, Arizona 85003

20. Mr. Omar Bunnell, Utah State Senator, Price, Utah 84501

21. Mr. John Garr, State Representative, Carbon County, Dragerton, Utah 84520

22. Mr. Mike Dimitrich, State Representative, Carbon County, Price, Utah 84501

23. Mr. Vance Aagard, State Representative, Sanpete County, Fountain Green, Utah 84632

24. Mr. Kenneth Stillman, State Representative, Grand & Emery Counties, Green River, Utah 84525

25. Mr. C. Alfred Frost, State Representative, Monticello, Utah 84535

26. County Commissioners, Grand County, Moab, Utah 84532

27. County Commissioners, Emery County, Castle Dale, Utah 84513

28. County Commissioners, Carbon County, Price, Utah 84501

29. County Commissioners, San Juan County, Monticello, Utah 84535

30. County Commissioners, Kane County, Kanab, Utah 84741

31. County Commissioners, Garfield County, Panguitch, Utah 84759

32. County Commissioners, Sanpete County, Manti, Utah 84642

33. Mr. Clyde Conover, Water and Power Board, Ferron, Utah 84523

34. Mr. H. A. Brownfield, Board of Big Game Control, Price, Utah 84501

35. Mr. Robert L. Herbst, Commissioner of Natural Resources, State of Minnesota, St. Paul, Minnesota 55101

Conservation and Environmental Groups

1. Mr. Thomas L. Kimball, Executive Director, National Wildlife Federation, Washington, D.C. 20036

2. Mr. William E. Towell, Executive Vice President, The American Forestry Association, Washington, D.C. 20006

3. Mr. Daniel A. Poole, President, Wildlife Management Institute, Washington, D.C. 20005

4. California Wildlife Federation, Sacramento, California 95814

5. Friends of the Earth, San Francisco, California 94133

6. Mrs. Janet M. Stake, Librarian, Sierra Club, San Francisco, California 94104

7. Mr. Bud Sullivan, Utah Wildlife & Outdoor Recreation Federation, Salt Lake City, Utah 84101

8. Mr. Jack McClellan, Sierra Club, Salt Lake City, Utah 84121

9. League of Women Voters, Mrs. Patrick J. Brennan, Salt Lake City, Utah 84105

10. Mr. James M. Hardman, Trout Unlimited, Salt Lake City, Utah 84111

11. Mr. D. H. McGarry, Izaak Walton League, No. 53, Salt Lake City, Utah 84107

* 12. Mr. Harold B. Lamb, Utah Audubon Society, Salt Lake City, Utah 84102

13. Mr. Jim Fowler, Member, National Audubon Society, Denver, Colorado 80211

14. Mr. Clifton Merritt, President, Wilderness Society of America, Denver, Colorado 80222

15. Mr. Morey Wolfsen, Director, Environmental Action Committee, Denver, Colorado 80202

* 16. Mr. John R. Bartlit, State Chairman, New Mexico Citizens for Clean Air and Water, Los Alamos, New Mexico 87544

17. New Mexico Citizens for Clean Air and Water, Arroyo Hondo, New Mexico 87513

18. Mr. Thomas H. Noble, The Central Clearing House, Santa Fe, New Mexico 87501

19. Mr. John A. McComb, Sierra Club Southwest Office, Tucson, Arizona 85719

20. Native American Rights Fund, Boulder, Colorado 80302

21. Mr. N. A. Winter, Jr., Regional Director, National Wildlife Federation, Phoenix, Arizona 85016

22. Mrs. June Viavant, Director, Board of Directors, Sierra Club, Salt Lake City, Utah 84102

23. Mr. Larry Cloyd, California Wildlife Federation, Sacramento, California 95814

Utility Companies

* 1. Utah Power & Light Company, Salt Lake City, Utah 84110

2. Mr. R. N. Coe, Chairman, Environmental Committee, Western Systems Coordinating Council, Los Angeles, California 90053

3. Mr. A. E. Rhodes, New Mexico Public Service Company, Albuquerque, New Mexico 87103

Universities

* 1. Dr. Dorald M. Allred, Coordinator, Center for Environmental Studies, Brigham Young University, Provo, Utah 84601

2. Mr. William P. Hewitt, Director, Utah Geological Survey, University of Utah, Salt Lake City, Utah 84112

3. Dr. George R. Hill, Dean, College of Mines & Mineral Industries, University of Utah, Salt Lake City, Utah 84112

4. Prof. Wm. McNulty, Chairman, Committee for Natural Sciences, Utah Heritage Foundation, University of Utah, Salt Lake City, Utah 84112

5. Mr. Lane Wilkins, Reference Librarian, Law Library, University of Utah, Salt Lake City, Utah 84112

6. Mr. George Grossman, Law Library, University of Utah, Salt Lake City, Utah 84112

7. Dr. E. Fred Lashley, Jr., Department of Geology and Geography, Weber State College, Ogden, Utah 84403

8. Dr. Thadis W. Box, Dean, College of Natural Resources, Utah State University, Logan, Utah 84321

9. Dr. Vincent J. Schaefer, State University of New York at Albany, Schenectady, New York 12306

10. Dr. Michael Williams, John Muir Institute, University of New Mexico, Albuquerque, New Mexico 87106

11. Mr. Ronald D. Clark, Asst. Professor, Department of Chemistry, New Mexico Highland University, Las Vegas, New Mexico 87701

Newspapers

1. Mr. Hartt Wixom, c/o DESERET NEWS, Salt Lake City, Utah 84111

2. Mr. Bob Woody, c/o SALT LAKE TRIBUNE, Salt Lake City, Utah 84111

3. Mr. Alex Bene, Editor, THE SUN ADVOCATE, Price, Utah 84501

4. Mr. Sam Taylor, Publisher, TIMES INDEPENDENT, Moab, Utah 84532

5. Mr. Douglas Wright, Publisher, PROGRESS-LEADER, Castle Dale, Utah 84513

6. Mr. Larry Stahle, Publisher, MANTI MESSENGER, Manti, Utah 84642

7. Publisher, MT. PLEASANT PYRAMID, Mt. Pleasant, Utah 84647

Private Organizations

1. Mr. C. Leon Feight, Executive Director, Utah Oil & Gas Cons. Comm., Salt Lake City, Utah 84116

2. Mr. R. Lavaun Cox, Western Division Manager, Rocky Mtn. Oil & Gas Assn., Salt Lake City, Utah 84101

3. Mr. James McGill, Rocky Mtn. Fed. of Min. Soc., Salt Lake City, Utah 84120

4. Mr. Sherman Harmer, Utah Cattlemen's Assn., Salt Lake City, Utah 84101

5. Mr. Paul S. Rattle, Manager, Utah Mining Association, Salt Lake City, Utah 84101

6. Upper Colorado River Commission, Salt Lake City, Utah 84111

7. Dr. Charles S. Peterson, Director, Division of State History, Salt Lake City, Utah 84102

8. Dr. LeRoy Kuehl, Wasatch Mountain Club, Salt Lake City, Utah 84108

9. President, Wasatch Mountain Club, Salt Lake City, Utah 84104

10. Dr. Stan Mulaik, Utah Nature Study Society, Salt Lake City, Utah 84102

11. Marcellus Palmer, Executive Secretary, Utah Woolgrowers' Assn., Salt Lake City, Utah 84111

12. Utah Water Pollution Control Association, Salt Lake City, Utah 84109

13. Mr. Jack E. Christensen, Executive Director, Utah Association of Counties, Salt Lake City, Utah 84101

14. Mr. Thomas E. Cahill, Western States Water Council, Salt Lake City, Utah 84111

15. Mr. Clyde Ritchie, President, Utah Water Users' Association, Heber City, Utah 84032

16. Mr. Mike Frome, Conservation Editor, FIELD AND STREAM Magazine, Alexandria, Virginia 22309

17. Mr. Ray Bitters, Intermountain Sportsman's, Kaysville, Utah 84037

18. Mr. David Wallace, President, Utah Sportsman's Assn., Sunset, Utah 84015

19. Mr. Frank W. Bohman, Utah Assn. of Soil Conservation, Morgan, Utah 84050

20. Mr. Lloyd Stevens, Supervisor, Southeastern Region Office, Division of Wildlife Resources, Price, Utah 84501

21. Mr. Gardell Snow, Southeastern Utah Economic Development District, Price, Utah 84501

22. Mr. Don Hoffman, Grand County Industrial Development Committee, Moab, Utah 84532

23. Mr. Keith Ware, Emery County Industrial Development Committee, Orangeville, Utah 84537

24. Mr. Lenn Jensen, San Pete Industrial Development Committee, Manti, Utah 84642

* 25. Mr. Bob Folks, Four Corners Regional Commission, Farmington, New Mexico 87401

26. Mr. Donald Juneau, Dinebeinna Nahiilna Be Agaditahe, Shiprock, New Mexico 87420

* 27. Peabody Coal Company, Phoenix, Arizona 85012 and St. Louis, Missouri

28. Museum of Northern Arizona, c/o Dr. Eric G. Walther, Executive Director, Colorado Plateau Environmental Advisory Council, Flagstaff, Arizona 86001

29. Mr. A. J. Pfister, Salt River Project, Phoenix, Arizona 85001

30. Mr. Jim Hunt, SCOPE, Environmental Protection Agency, San Francisco, California 94102

31. Mr. Robert Allen, Dames & Moore, Atlanta, Georgia 30309

32. Mr. F. E. Courtney, Jr., Manager, Air Quality Envicon, Inc., Atlanta, Georgia 30328

Individuals

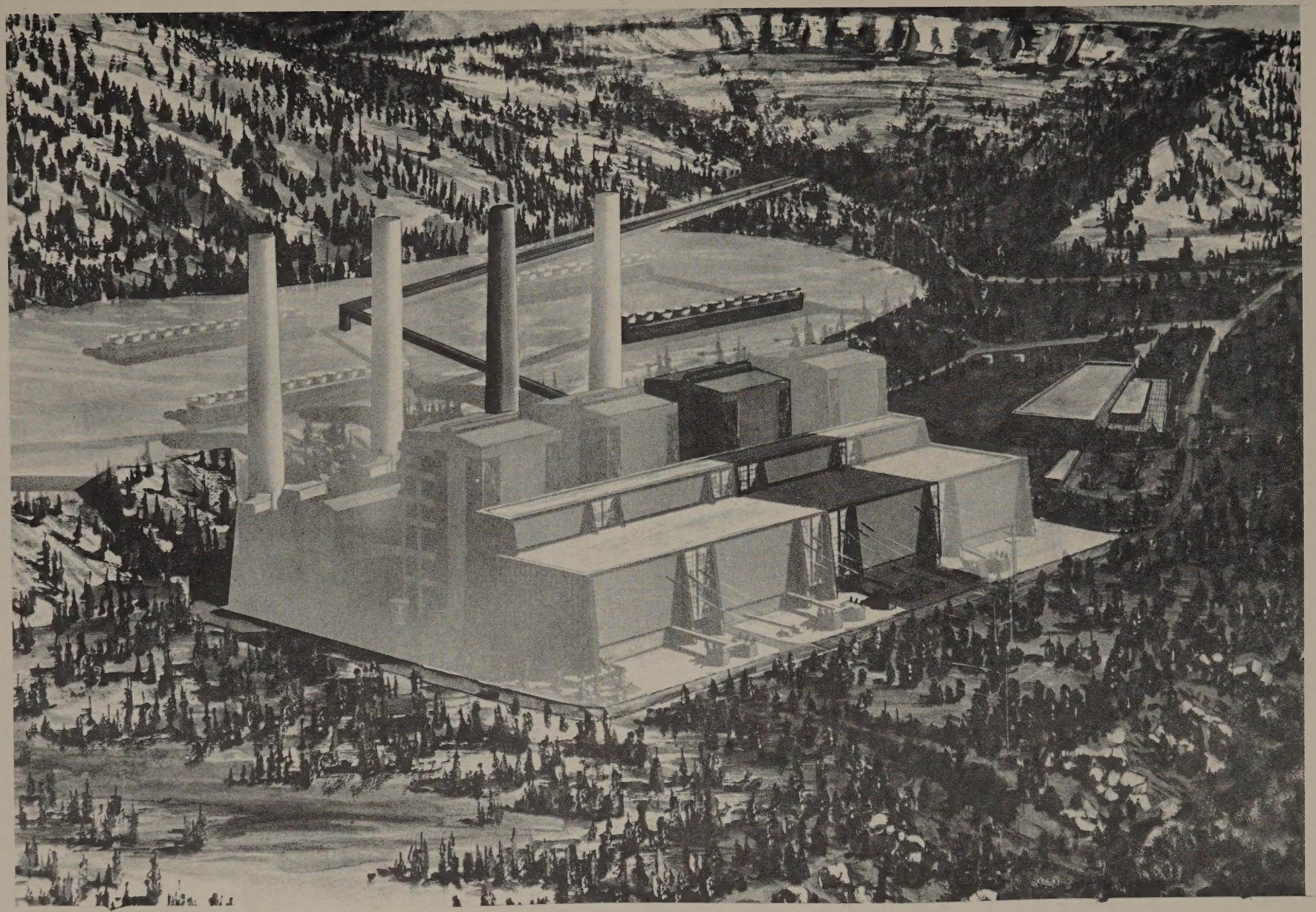
1. Mr. Fred L. Montmorency, Ogden, Utah 84403

* 2. Mr. John Herbert, Ogden, Utah 84403

3. Mr. Virlish Fischer, Las Vegas, Nevada 89104

* 4. Miss Jean Torosian, Salt Lake City, Utah 84109

* Comments received and attached



Artist's Conception of Huntington Canyon Generating Station

1. GENERAL DESCRIPTION OF THE HUNTINGTON CANYON GENERATING STATION, COAL MINE, AND TRANSMISSION LINE

1.1 Generating Station

The first 430-MW unit of a thermal-electric generating station known as the Huntington Canyon Generating Station (hereafter referred to as Station) is under construction by the Utah Power & Light Company (hereafter referred to as Company) in Emery County, Utah, approximately 29 miles by road southwest of Price, Utah, as shown on the following location map. Ground was broken for the first 430-MW unit March 8, 1971. The first unit was approximately 8% complete as of March 1, 1972, and is planned to be on line in 1974. The Company's present load-growth projections indicate a second unit will be needed by 1977. The Station may ultimately have a 2,000-MW capacity. An analysis by Federal Power Commission of the need for the Station is given in its letter of January 21, 1972, copy of which is included in Section 9 hereof.

The accompanying drawing (Huntington Canyon SE Station Site Plan) shows the proposed Station layout.

Impacts that can be identified with units after the first 430-MW unit, up to a total of 2,000-MW are included in this Environmental Statement. The major impact which cannot be identified is that which will result from construction of additional transmission lines to serve the additional units contemplated. Additional environmental statements will, therefore, be required prior to the time any Federal actions are considered for additional units.

The majority of the land on which the Station is being constructed was owned by the Utah State Division of Wildlife Resources. A 36-acre tract is under the jurisdiction of the Bureau of Land Management. A small part is privately owned. The Company has a contract with the Utah State Division of Wildlife Resources to exchange the Station site land for other lands, and the land has been deeded to the Company. BLM has issued a permit for use of the tract under its jurisdiction. Arrangements are under way to transfer this tract to the State of Utah as lieu land, and the Company would then purchase it from the State. A photograph of the Station site follows.

Water to be utilized by the Company would be procured under three separate arrangements:

1. By proposed contract with the Department of Interior and Emery Water Conservancy District. This water was originally developed by the Department of Interior to provide supplemental irrigation water to existing irrigated land in the area.

2. From irrigation water rights acquired by the Company from individual landowners in the area.

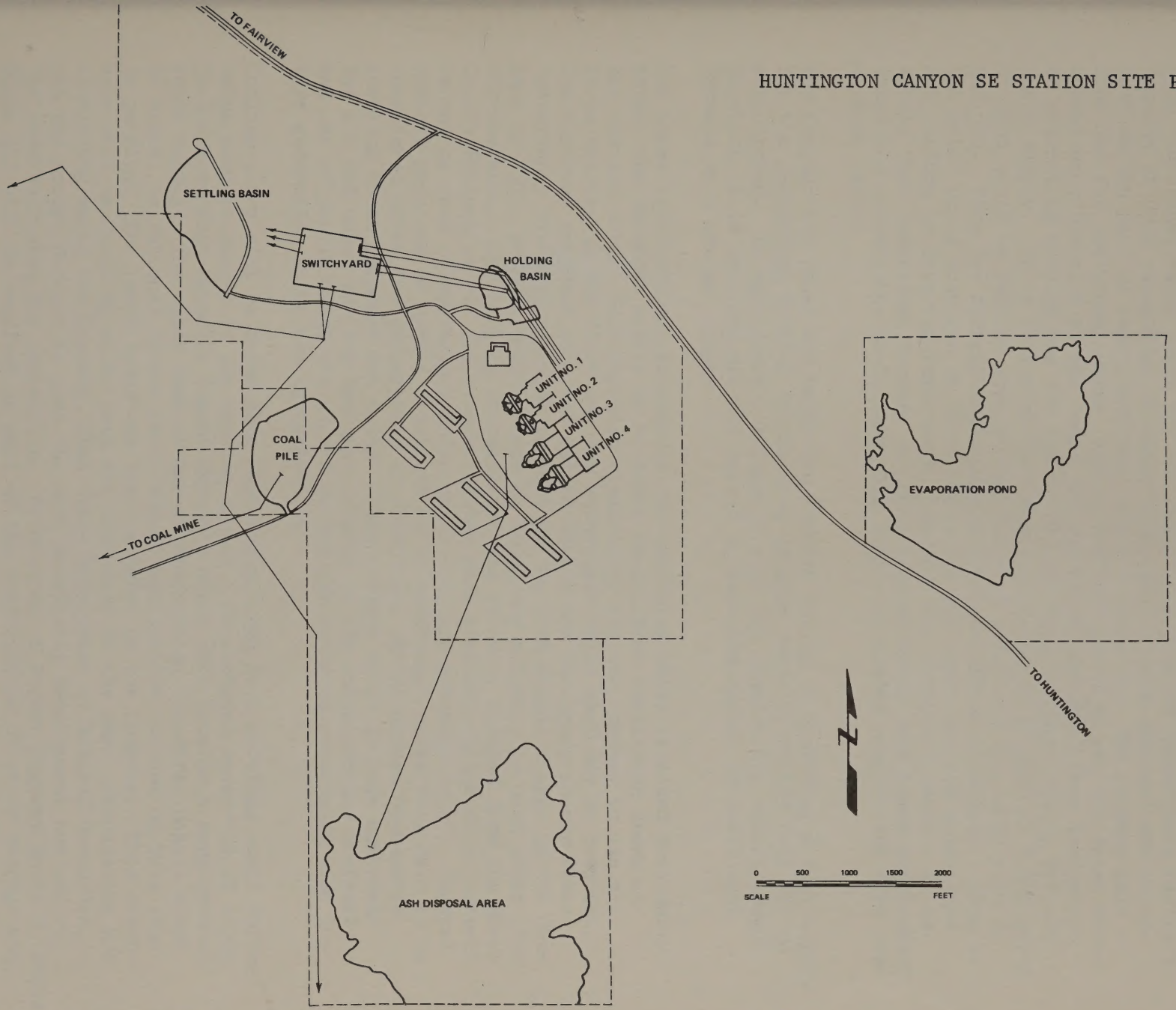
3. Water rights granted to the Company by the Utah State Engineer.

Huntington Canyon Generating Station Site

HUNTINGTON SE STATION

EXHIBIT A

HUNTINGTON CANYON SE STATION SITE PLAN



The first two categories may eventually result in the retirement of some irrigated lands in the area. The relinquishment of both Emery County Project water and individual water rights was negotiated by Company officials with individual water users and the Emery County Water Conservancy District. Amounts of both categories of water relinquished were optional and voluntary on the part of each individual and the District. The Company paid a flat fee for individual water rights, and has agreed to pay the Emery Water Conservancy District at M&I rates for all water converted from irrigation to generating station use for the 6,000 acre-feet of Emery County Project water supply. It is estimated that the equivalent of as much as 4,400 acres of land could be removed from production as a result of the conversion to M&I use. Very few farmers relinquished their entire water supply. Some of the water being acquired by the Company has been used on land which does not conform to Interior Department standards for irrigable lands. It is likely that individual farmers would relinquish water from these substandard lands and concentrate their remaining supply on higher quality and more productive lands.

The Company has based its water acquisition policy on providing a full supply for the generating station in the most adverse years of runoff that can be anticipated. In many years the Company will not require the entire amount to which it is entitled and has agreed to rent the excess to individual farmers at a nominal charge.

The three institutional procedures for obtaining water itemized previously permit the physical supply to be taken wholly from Huntington Creek at the Station site. This provides flexibility for the Company to use all three sources on the first and any subsequent units that may be proposed. The contract proposed with the United States and the Emery County Water Conservancy District requires payment of the full annual charge by the Company by 1977, or such earlier date as water may actually be used under this circumstance. The Company contemplates use of water derived from the Emery County Project on its first unit. Water made available under this contract cannot be used on subsequent units until they are actually built. Federal actions required to permit construction of additional units will have to be considered after the preparation of additional Environmental Statements covering those proposed new units. Such actions would include approvals for air and water quality features covered in the water service contract and use of public lands for rights-of-way for features associated with future generating units and transmission.

Cooling water will be taken from Huntington Creek to a settling basin before being used as makeup in the cooling system. An upstream reservoir of about 30,000-acre-foot capacity (named Electric Lake) will provide a supplemental water supply. The upper part of the reservoir area (Electric Lake), about 40 acres, is National Forest land, and an application for use of this land is pending. The lower reservoir area is owned by the Company. This reservoir will be about $4\frac{1}{2}$ miles long and 215' deep at the dam. Discussions are continuing among the Company, Utah State Department of Natural Resources, and the Forest Service to plan the most beneficial development and use of the reservoir area for recreation. Relocation of Forest Highway Route 7 (State Route 31) will be required as part of the construction of water storage and supply facilities.

1.2 Coal Mine

Fuel for the Station will be coal from an underground mine, to be operated by the Peabody Coal Company, about $2\frac{1}{2}$ miles from the Station. The mine is located on lands owned or leased by the Company within the boundaries of the Manti-La Sal National Forest. Coal will be mined by underground methods from two major seams. The thickness of the coal seam in the Blind Canyon seam is about 13 feet. The thickness of the Hiawatha seam explored is about 10-13 feet. The underground mine will employ bolted-roof protection with sidewall cribbing where necessary. The Company anticipates that there will be no excess water during the mining operation; but if excess water is encountered, it will be directed to settling ponds for Station use, or to evaporation ponds. The coal will be conveyed to the Station as mine run. No washing will take place at the mine. Coal will be transported to the Station by covered conveyor. Average coal consumption is estimated at 1 million tons per year for a 430-MW unit. Coal reserves are estimated to be sufficient for a 2,000-MW Station for its projected 35-year life.

1.3 Transmission Line

Energy from the intial unit will be transmitted principally over a 345-KV line to Camp Williams, near Salt Lake City, Utah, and to the Four Corners Area, where it interconnects with the Arizona Public Service Company system. The line was completed as a part of the Company's system in June 1971. A map showing the route of the line is included in the Appendix (A-1). In a letter of January 21, 1972, the Federal Power Commission commented as follows on this transmission line:

> "The prime market for the power from the Huntington Canyon Generating Station is the Salt Lake City load center of the Applicant's service area where approximately 70 percent of the Applicant's load is concentrated. The peak load of this area in 1970 was 880 megawatts and is expected to grow to 1,760 megawatts in 1980 and 3,540 megawatts in 1990. Thus the 345-kilovolt transmission line running northwest about 100 miles to the Salt Lake City load center is a necessary consequence of the Company's decision to construct a mine-mouth plant at the Huntington Canyon site.
>
> "The section of 345-kilovolt transmission line running southeast approximately 250 miles to the Four Corners Area will strengthen the interconnections between the systems of the Pacific Northwest and those of the Pacific Southwest and contribute to the general interchange capability and improve stability of the western bulk power transmission network. These considerations lead us to conclude that both branches of the 345-kilovolt transmission line stretching northwest and southeast of the Huntington Canyon Generating Station are important components of the proposed generating facility which will have a beneficial influence on the stability of the entire western transmission network, particularly in the area along the eastern side of the north-south loop."

Additional transmission capacity will be required as generating units (after the first 430-MW unit) are brought on line. The location and approval of right-of-way for these additional lines will be considered by the Department of Interior at the time they are proposed for construction and the Department's consideration will be based on Environmental Statements covering the additional units and transmission lines prepared prior to the time Federal actions are requested. It would be impossible for the Company to build additional transmission lines from Huntington Canyon without crossing public lands so additional units must have the concurrence of the Department of Interior and probably of the Department of Agriculture (U.S.F.S.).

1.4 Federal Land Jurisdiction

The construction, operation, and maintenance of a dam to provide water storage in Huntington Canyon, the necessary relocation of Forest Highway Route 7 (State Route 31), coal mining, and coal conveyance system, as well as the construction and operation and maintenance of the Station and transmission line, will affect lands, resources, and interests that are the responsiblity of the Department of Agriculture, Forest Service; Department of Transportation, Federal Highway Administration; Department of the Interior, Bureau of Land Management and Bureau of Sport Fisheries and Wildlife, in addition to the Bureau of Reclamation.

1.5 Application of Section 11 - CEQ Guidelines

Section 11 of the Guidelines for Federal Agencies of the Environmental Policy Act provides the following:

> Application of Section 102(2)(C) procedure to existing projects and programs. To the maximum extent practicable, the Section 102(2)(C) procedure should be applied to further major Federal actions having a significant effect on the environment even though they arise from projects or programs initiated prior to enactment of the Act on January 1, 1970. Where it is not practicable to reassess the basic course of action, it is still important that further incremental major actions be shaped so as to minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.

As of January 1, 1970, years of investigation had been completed and actions taken so that it was not possible to reassess the basic course of action relative to the first unit of the Station and still meet the Company's system demands. Both the Company and Government agencies, however, have taken all appropriate action in compliance with Section 11 of the Guidelines. Following is a general review of those actions they had taken in connection with the construction of the Station and transmission line prior to and shortly after enactment of the National Environmental Policy Act to illustrate the impracticability of reassessing the basic course of action to proceed with construction.

A study of possible sites had been started as early as 1967, but was placed on an urgent basis early in 1968 as it became apparent that additional energy would be required for the Company's interconnected system by 1974. The availability of coal and water was first investigated in 1967, and this investigation continued through the remainder of 1968. A letter of intent covering coal purchases was executed in September 1969. With the assurance that coal and water were available in sufficient quantities in Huntington Canyon, efforts were pressed for the preparation of plans for the Station, for the reservoir, and for the transmission line.

Discussions with water users leading to the purchase of water stock were initiated in March of 1968 and continued throughout the years 1968-69 and consummated in the execution of contracts with the Huntington-Cleveland Irrigation Company and the Cottonwood Creek Consolidated Irrigation Company in December 1969. Arrangements were made at the same time to secure options from the individual stockholders. The option forms were prepared, the options were secured during the period between December 1969 and March 1970, and were exercised in December of 1970. Negotiations with the Emery Water Conservancy District to acquire water from the Emery County Federal Reclamation Project were also initiated in 1968. Drafts of contracts to make this water available to the Company are now awaiting approval of the Department of Interior.

After the options had been secured and the amount of water obtainable had been more or less accurately determined, final plans could then be made for the reservoir, to be known as Electric Lake. The necessary applications for the reservoir had been filed in December 1968 with the Utah State Engineer. The reservoir site investigation and preliminary engineering were commenced in the fall of 1969. In the meantime, and commencing late in 1969, negotiations were commenced with the Utah State Road Commission, the Forest Service, and the Bureau of Public Roads with regard to the relocation of the Huntington Canyon Highway. The contract was executed on November 10, 1970, under which the Company agreed to pay and has paid the engineering cost involved in this road relocation.

Commencing early in 1969 and continuing throughout the year, a series of meetings were held with representatives of the Forest Service and the Bureau of Land Management with respect to the location of the Camp Williams-Four Corners 345-KV transmission line. Right-of-way applications were filed with these agencies late in 1969 and early in 1970, and purchase of private right-of-way commenced in February 1970. Most of the material--including poles, insulators, conductors, and crossarms--was purchased in November and December 1969. The construction contracts were awarded in January 1970, and the construction actually commenced in March and April of that year.

In connection with the Station itself, it can be noted that bids were invited for the turbo-generator in June 1969, and a letter of intent for its purchase was issued in August 1969. Bids for the steam generator were invited in November 1969, and a letter of intent for this item issued in June 1970. The engineering contract with Stearns-Roger was approved in

March 1970 after having been in the negotiating stage for a number of months. It must be kept in mind with respect to all of the dates set forth above, upon which final action was taken, that they represent many months of preparation and negotiation.

As of December 31, 1971, the Company had expended about $37 million in construction of the Station and transmission line. Total commitments on the Station alone through January 1972, in addition to those expenditures, amounted to $43.5 million.

2. DESCRIPTION OF THE ENVIRONMENT

2.1 Station Site and Water Supply Facilities' Area

2.1.1 Geology and Landforms - Huntington Creek

Approximately 3,500 feet of sedimentary rocks, ranging in age from Upper Cretaceous to Tertiary, are exposed in the drainages of Huntington Creek and the Left Fork of Huntington Creek.

The rock strata are essentially flat lying, but with a slight regional dip westward, ranging from southwest to northwest. Dips in almost all directions, from localized folding, have been noted in the area of the proposed road relocation and the reservoir. The relationship between the dip of the beds and the interfaces between more permeable and less permeable rock may be critical to slope stability under conditions of surface disturbance and water-level fluctuation.

The rock strata are broken by groups of normal, high-angle faults. One group, trending approximately north-south, extends from the Scofield Reservoir area to the emergence of lower Hungington Creek at the Forest Boundary. Another, also trending approximately north-south, extends from south of Joes Valley to the upper Huntington Creek-Gooseberry Divide. Another, trending northeast-southwest, crosses the upper Huntington Creek area in the general vicinity of the proposed reservoir and road relocation, from the head of the gorge of the Left Fork of Huntington Creek. Gross landforms derived are: Graben Valley crossed by tributaries of the Left Fork (structurally adjusted stream courses) faultline scarp ridges. Faults indicate the area has been seismically active.

Glacially-formed topographic features are characteristic of the tributary areas of the western drainages of Huntington Creek and Left Fork of Huntington Creek--cirques, moraines, widened valleys, and outwash deposits.

The drainage ranges in elevation from about 6,500 feet at the lower Forest Boundary to over 11,000 feet at the highest divide.

2.1.2 Climate

The climate within the proposed project area is varied. Lower Huntington Canyon is a semi-arid environment (12 inches precipitation annually). Primarily, the precipitation received is from summer storm activity. These are usually high-intensity thunderstorms. Winter snows on the area are generally not excessive. The nights are cool to warm with hot daytime temperature in the summer. The prevailing winds are generally from the southwest with the normal up and down-canyon variations. Upper Huntington Canyon has a semihumid montane environment (30-40 inches preciptation). Precipitation on this area is primarily from winter snow. The winter snowpack is substantial. Summer storms are quite prevalent. The nights are cool and the days warm throughout the summer months. The prevailing winds are generally from the southwest and west on the area.

Air quality has not been a problem in this general area, with the exception of some small isolated cases of inversion.

2.1.3 Meteorology

The Station site is far removed from the places in Utah and Colorado, where observations of upper air winds and temperatures are regularly made by the National Weather Service. Intervening high-mountain ranges and local canyon topography combine with distance to prevent reliable extrapolation from available, long-term upper air records in inferring the diffusional behavior of the atmosphere in the vicinity of the site. Local observations, in combination with general knowledge of the effects of canyon topography on atmospheric circulation, offer the best available basis for prediction of plume dispersion from the Huntington Canyon site.

In recognition of this, the Company contracted with North American Weather Consultants (NAWC) in 1969 to carry out a meteorological study of the proposed Station site.

1. Onsite Meteorological Program

In mid-December 1969, NAWC installed a meteorological station at the proposed Station site. This meteorological station consists of an anemometer mounted on an 18-foot pole with a standard instrument shelter 6 feet above the ground, housing the wind recorder, a hydrothermograph, and a maximum-minimum thermometer. Continuous recordings of surface temperature and humidity and winds at the 20-foot level are made. In March 1970, the meteorological program was expanded to include twice weekly soundings of the vertical structure of temperature and humidity. These are made by flying an instrumented aircraft between elevations of about 6,500 feet and 11,000 feet in Huntington Canyon. For flight safety reasons, the focal point of the sounding flights is approximately 3 miles southeast of the Station site.

Beginning in August 1970, the onsite meteorological program was further augmented by four data-collection expeditions held August 2-8, 1970; September 23-28, 1970; December 3-8, 1970; and January 27-February 1, 1971. These field expeditions collected upper air information using rawinsondes (radio wind sounding equipment), rapidly rising pilot balloons, and low-lift constant volume balloons which tend to follow streamlines in moving air. In addition to the Station site data, observations were taken in the town of Huntington during each of the latter three field expeditions. These included surface winds, surface temperatures, and winds aloft determined by theodolite tracking of pilot balloons.

To February 1, 1971, 122 aircraft soundings, 42 rawinsondes observations, 224 pilot balloon observations, and 70 air mass trajectory observations made with low-lift constant volume balloons had been taken in addition to the surface records previously described. The data-collection program by NAWC was summarized in its report of April 1971,[2] and onsite measurements are continuing.

2. Observations

The winds in Huntington Canyon are observed to be a vigorous mountain-valley system with classic up-canyon flow during daytime hours and down-canyon flow during night and morning hours. The morning transition occurs around 9 to 10 a.m. and the evening one between 4 and 7 p.m. Seasonal variations have been observed with considerable stronger winds and longer duration up-canyon flows in summer than in winter. The circumstances most adverse for plume dispersion should occur in winter, when the highest potential for stagnation should exist.

Observations taken during dominance of high barometric pressures indicate that the subsidence inversion and the ground-level inversion produced by nocturnal radiation are clearly separate. Bases of the subsidence inversion are around 2,000 feet above the surface while the ground inversion extends from the surface to about 400 feet. On stagnant winter days, insolation can generally, but not always, be expected to eliminate the ground-level inversions during the morning hours, but the heating is generally insufficient to remove the upper inversions formed between 2,000 and 3,000 feet by the subsiding high-pressure air masses. Such days are characterized by weak up-canyon flow during the midday period with the vertical mixing depth restricted to about 2,000 feet. Night and morning flows during such cases of limited mixing provide persistent horizontal ventilation with a pronounced low-level jet at about 300 to 400 feet above the surface.

The constant volume balloon observations taken on up-canyon flow indicated chimney effects in the narrow upper part of Huntington Canyon. The balloons were either lifted over the ridge northwest of the Station site or continued up Huntington Canyon. In winter cases of down-canyon flow, the trajectories of constant volume balloons tended to turn from southeasterly headings to the south on nearing the canyon mouth. This suggests that the centerline of the diffusing plume from the Station could pass south of the town of Huntington during stable winter episodes. How reliably this would happen could only be answered by extensive further observations.

2.1.4 Soils

In upper Huntington Canyon, the topsoils within the proposed project area vary from a silt loam to silty sand. The gradient and stability likewise vary throughout the project--from very steep side slopes with stability problems in the proposed dam and road takeoff area to more moderate, rolling type topography with fairly stable characteristics along the upper portions of the project.

In the lower reaches of Huntington Canyon, soils in the project area are principally stony sandy loam from alluvial deposits and outwash from the slopes. Large rocks and boulders are abundant--both on top and beneath the surface. Numerous rock-ledge outcrops are on the area. In general, the area is eroded with moderate to large gullies in the canyon bottoms.

2.1.5 Water

Huntington Canyon comprises the watershed that supplies both culinary and irrigation water for North Emery County. Water is stored in reservoirs during periods of high flow for release throughout the water-short summer months. In years past, portions of the watershed have been abused which caused local flooding and a degradation of water quality. More recently, the watershed has become more stabilized which has improved both the quantity and quality of the water. Agriculture has been a considerable share of the economy in northern Emery County; hence the water is very important.

2.1.6 Vegetation

The vegetation in lower Huntington Canyon, including the Station site, is pinon-juniper and associated brouse and sage types. It is generally sparse. The upper reaches of Huntington Canyon are more open country with sagebrush-grass vegetation on moderate steep side slopes and generally open-canyon bottom.

In the vicinity of the proposed dam and reservoir, the vegetative type is generally sagebrush-grass on the side hills and wet meadow type along the creek bottoms. The timber type is scattered aspen with Douglas fir and spruce pockets on the north sloping ridges. Generally, the timber type is above the high waterline. The timber is more important aesthetically than commercially.

Along the proposed road relocation area, the vegetation varies from heavy spruce and sagebrush-grass-forb types to scattered aspen and sub-alpine type along the Skyline Drive. Present vegetative cover provides moderate protection to soils along the route. Within the proposed relocation area, there are several wet meadow types.

2.1.7 Animal Life

1. Wildlife

The proposed project area is used by big-game animals. Deer, elk, small mammals, nongame birds, and small game are found on the area. Big-game hunters use the area quite extensively during the fall hunting seasons. In the winter, animals move from higher country to the lower portions of Huntington Canyon. A list of mammals occurring in the Huntington Canyon headwaters is contained in the Appendix (A-2). The larger forms are generally wide-ranging and part of their habitat is the reservoir site and the powerplant site. Permanent residents in these areas are mostly the small rodents including ground squirrels, chipmunks, mice, and pocket gophers. The aquatic mammals, beavers and muskrats, are not common along Huntington Creek. Birdlife is an attractive and a significant element of the environment.

2. Domestic Animals

The proposed project area is used by several bands of sheep and some cattle for summer grazing.

2.1.8 Fisheries

Huntington Creek provides some of the best stream fishing in eastern Utah. The stream area that will be inundated by the proposed reservoir is some of the best habitat for fish reproduction that is found along the entire stream length. The gradient is not excessive, and there is abundant riparian vegetation along the stream banks. There is a list of fishes of the headwaters of Huntington Creek in the Appendix (A-4). There is a good native population of cutthroats and smaller numbers of reproducing brown trout. These fishes are supplemented with plants of rainbow trout during the fishing season.

2.1.9 Minerals

Throughout the immediate area, coal is the most prevalent and most sought after mineral. There are two main coal seams that are mined: the Blind Canyon seam which is about 13 feet thick, and the Hiawatha seam which varies in thickness from 10-13 feet. All of the mines in this area are mined by underground methods. Usually, these two coal seams come to the surface along the steep escarpment rising out of the valley. Mine portals are constructed along this face. Coal mining is an important component of the economic makeup for the entire area of Carbon and Emery Counties.

Recent developments in the coal-mining industry have introduced new methods and machinery. Fewer people can now mine more coal than the previous larger work force.

The importance of coal to this area has been magnified by the marketing and shipment of coal to the midwest and even to Japan. Large contracts have been entered into by local mines to supply several large industries.

With development of the project, the mines will benefit considerably from the increased technology that will be brought into the area.

2.1.10 Archaeology and Historical Values

The immediate area is not rich in archaeological history. The artifacts that are found indicate the area was used primarily as a hunting and traveling corridor. Brigham Young University was commissioned to conduct an in-depth review and survey of the area. No artifacts were found in this review.

Connelsville was established as a coal camp in 1874, and abandoned about 15 years later. It is the only known historical site in the area. This site will be inundated by Electric Lake. (See Section 3.1.6)

2.1.11 Natural Beanty

The landscape in lower Huntington Canyon is characterized generally by a pinon-juniper type vegetation community. The terrain rises steeply from the semidesert valley floor to high-mountain plateaus. There is a prominent escarpment of several hundred feet that rises spectacularly from the valley of Deer Creek Canyon. Large rock and talus slopes have tumbled down to form interesting scenic variations. The area abounds with deer in the winter and spring, and many people visit the area to witness their presence.

The area along the route of the Huntington-Fairview Forest Highway is comprised of a variety of vegetative types. The heavy spruce timber on the north slopes, where the road leaves Huntington Creek, gives way to sagegrass types. Farther along the route there is aspen and a sub-alpine type along the Skyline Drive. Wildlife and domestic animals utilize the area for summer grazing. They are visible from the travel routes. Many people enjoy the serenity that is found in viewing the natural beauty along the route.

2.1.12 Range

The area of the dam and reservoir is within five Forest Service grazing allotments. They are as follows:

Burnout	Cox Canyon
Coal Ridge	Kemmerer Coal
Sand Dugway	

There is a large block of private land owned by various people. Generally, these same people are permittees on adjoining Federal range. They manage the herds by waiving their private land and running one herd on both lands. This facilitates management.

The Range Environmental Analysis has been completed by the Forest Service on most of these allotments. Stocking will be adjusted to the indicated carrying capacity within the next few years. The livestock that are permitted on these and adjoining allotments are generally from Sanpete County. Sheep trailing routes either follow or cross Huntington Creek to get to the allotments on the east side of Huntington Canyon.

Private lands and public domain in the vicinity of the Station site receive moderate livestock grazing use. The area is also important for providing deer winter range.

2.1.13 Recreation

This general area is within one of the most heavily used recreation areas of the Manti Division of the National Forest. Flat Canyon Campground at the north and Old Folks' Flat Campground on the south are the only developed campgrounds in the vicinity of the proposed Electric Lake. People are using these areas in increasing numbers each year. The main recreation activities

engaged in by the visitors to the area are stream fishing, camping, picnicking, and the pleasure of aesthetic viewing. Big-game hunters make heavy use of the area during hunting seasons. It has been found at Joes Valley and Huntington North Reservoirs that people are enthusiastic about water-oriented sports where the opportunity exists.

2.2 Transmission Line

The transmission line passes through a great variety of land forms and vegetative types, as well as near some high-density populated areas. The map in the Appendix (A-1) shows the route of the line. A description of the terrain along the route follows:

The south end of the line begins at the Four Corners Generating Station in northwest New Mexico at an approximate elevation of 5,340 feet and proceeds in a northwesterly direction across the southwestern corner of Colorado and into Utah. The elevation through this section remains fairly constant, varying between 5,000 and 5,300 feet. Beginning at the generating station, the line crosses terrain consisting of relatively smooth hills and valleys until it drops down across the San Juan River near Shiprock, New Mexico. It then crosses numerous small washes and gulleys to the Cortez-Shiprock Highway. After crossing the highway, the country is level with a few rolling hills. There is a steep embankment just before the line crosses the Four Corners Highway in Colorado at which point there is a short section of somewhat rougher hills, then several long depressions and smooth ridges, leveling out and becoming fairly level to McElmo Creek on the Colorado-Utah border.

The soil between the Four Corners Generating Station and McElmo Creek, which is under the line, consists of sand by the San Juan River and, for the most part, Mancos shale.

The vegetation is typical of the southwest desert area. With the exception of a short section of Indian cultivation (mainly hay) on the banks of the San Juan River, the vegetation is very sparse, consisting mainly of scattered small desert plants, to the New Mexico-Colorado border. Across the section in Colorado, the vegetation is a little heavier with sagebrush and some cheat grass. West of Ute Mountain, there is an occasional heavier stand of cheat grass.

From McElmo Creek, the line climbs up onto a mesa and continues on the rather flat top until it drops into Montezuma Creek valley near Hatch, Utah. After crossing the valley, it ascends up onto Alkali Ridge and angles along the top of the ridge in a northerly direction, gradually raising in elevation from 5,300 feet to 6,000 feet at the rim of Devils Canyon south of Monticello, Utah.

The soil continues as a sandy loam along this stretch except for a sandy area in the Montezuma Creek valley. Around the edges of the ridges, there are outcroppings of sandstone.

After the line leaves the McElmo Creek area, the vegetation is a little heavier. The sagebrush is taller and there are spots of pinon-junipers. There are some grasses in the Montezuma Creek Valley, and from there to Devils Canyon the junipers gradually become thicker along the Alkali Ridge.

The line then goes through two wide canyons before crossing the scattered farmlands east of Monticello. The elevation gradually rises to 7,050 feet at the top of Peters Hill and then drops a thousand feet to the valley below.

The canyons are covered with pinon-junipers with spots of sagebrush and grass. The dry-farmed cultivation is mainly pinto beans and grain, with a small amount of grassy hay. The ground is rocky except in the cultivated areas, and there are more outcroppings of sandstone on the canyon rims.

After leaving the high plateau, the terrain consists of fairly level valleys, interrupted by small canyons and ridges which become rougher as the line reaches the foothills west of the La Sal Mountains. The elevation remains around 6,000 feet until dropping to 5,200 feet in Spanish Valley near Moab, Utah.

The vegetation is still pinon-junipers with grasses in the valleys. In this area, more and more of the red sandstone prevalent in this region begins to appear.

While crossing the Spanish Valley, the line gradually drops to 3,950 feet elevation at the Colorado River. The soil is generally sandy with grasses and sagebrush as the main ground cover. The line does not cross any cultivation in the valley.

North of the Colorado River, the line climbs up through Moab Canyon and continues in a northwesterly direction crossing the Green River about 3 miles south of Green River, Utah. The elevation at the top of the canyon is 4,700 feet and gradually decreases as it nears the river to 4,050 feet at the crossing. The terrain is mainly low-rolling hills. The soil is very sandy for a short distance from the Colorado River before changing to the red sandstone of Moab Canyon. Once on top, the sand reappears and gradually changes to Mancos shale, which is prevalent for the remainder of the distance to the Green River. Near Moab, the vegetation consists of grasses and sagebrush; but this soon disappears, and the only vegetation that can be found consists of hardy desert plants.

The terrain from the Green River west to the San Rafael Reef is generally flat with numerous small washes draining into the Green River. Soils are sandy loam and Mancos shale. The vegetation consists of stunted grama grass and mat salt brush.

The transmission line then traverses northwesterly through the San Rafael Reef in the drainage known as Cottonwood Wash. The wash lies in a transitional area between the Green River Desert and the higher Cedar Mountain

Plateau. The Cedar Mountain Plateau, at approximately 6,000 feet, is prominent with deep sandstone washes that drain into the Cottonwood Wash. Soils are sand and sandy loam in the lower areas with slick rock on the wind-faced edges.

From the south base of Cedar Mountain to Huntington lies a large flat bench called Buckhorn Flat. This 25-mile strip was partially reseeded for grazing leases by the BLM. The bench has sandy loam soils with crested wheat and rice grasses in the reseeded areas. There are some sparse stands of pinon-junipers.

Leaving Buckhorn Flats, the line continues 3 miles south of Huntington, Utah, at an elevation of 5,700 feet, where it crosses $3\frac{1}{2}$ miles of cultivated farms consisting mostly of alfalfa, grain, and corn. The soils are mostly blue clays with little sand present.

From Huntington to Huntington Station site, the line traverses the south side of Huntington Canyon, a heavily eroded area with numerous small canyons. The soils are clay, sand, and gravel. The vegetation is pinon-junipers, sagebrush, and grasses.

The Huntington Station site elevation is 6,400 feet and is the terminus of the Huntington-Four Corners section of the line.

Beginning at Huntington Station site, the transmission line is routed generally northwest and for the next 25 miles crosses the Manti National Forest, which is on a mountain range running north and south, and which is part of the Wasatch Mountain Range. Two miles west of the Station site, the line starts the long climb to the top of the mountain by following Meeting House Canyon.

This canyon is deeply scarred in the bottom by a large wash and is boulder-strewn throughout. The canyon has some conifers, mountain mahogany, wild rosebushes, and pinon-junipers.

At the head of Meeting House Canyon, an abrupt raise occurs at elevation 7,600 feet. A 1,200-foot cliff denotes the beginning of the high-rolling mountain tops of the La Sal Mountains. Soils consist of 1 to 2 feet of topsoil, with clay and rock subsoils. Vegetation is scattered conifer, aspen, low brush with moderate grasses.

From the top of Meeting House Canyon, across the mountain and through Joes Valley, the elevations vary from 8,600 to 10,500 feet.

The terrain is generally smooth-rolling hills with large drains and some steep side slopes.

The east side of the mountain known as East Mountain is a long, flat-inclined ridge void of timber, sagebrush covered, and very little topsoil, mostly fractured cap rock.

The middle portion of the mountain is Joes Valley, a long valley running north and south. Nestled between the east and west summits at an elevation of 8,500 feet, Joes Valley is a fairly flat area five miles wide with stands of pine and aspen trees.

The line leaves the mountain via Potters Canyon and Dry Pole Canyon.

Potters Canyon heads at the west rim at elevation 10,600 feet and is the beginning of Dry Pole Canyon, which is 3.5 miles long, and is a steep narrow canyon covered with brush and aspen trees. The bottom of the canyon is 6,600 feet and is the end of the mountain.

The remaining portion of the line is situated in typical western valleys, flat, with some sagebrush and pinon-juniper cover, moderate washes or drainages, at an average elevation of 5,000 feet.

The north terminus is located 25 miles south of Salt Lake City and is known as Camp Williams Substation.

2.3 Forest Highway

Relocation of Forest Highway Route 7 (State Route 31) around the proposed dam and reservoir (Electric Lake) will be required. The relocation begins at Station 1325+00, approximately 27 miles west of Utah State Route 10 through Huntington, Utah. From the beginning, the road stays on the north side of Huntington Creek in the bottom of the canyon to about Station 1330, where it crosses the creek and starts to climb up the south side of the canyon to clear the Electric Lake Dam and Reservoir. After climbing out of the canyon to clear the dam, the route proceeds west to about Station 1380, where it turns south up a large draw toward Cleveland Reservoir. It passes north of Cleveland Reservoir staying high enough to clear any possible future high-water level. Continuing northwesterly, the proposed route passes northeast of Huntington Reservoir; thence north and west crossing the Skyline Drive at about Station 1790; thence westerly and northerly about 1 mile west of Fairview Lakes, and continuing northerly to connect with the present road from Fairview at about Station 2080, approximately 2 miles directly north of Fairview Lakes. Prior to the decision to develop the generating facilities, the Federal Highway Administration had surveyed the Forest Highway route up the bottom of the canyon essentially on the present road. The proposed road design provides for minimum roadway width in accordance with American Association of State Highway Officials' design criteria. The proposed typical section provides two 11-foot traffic lanes, 4-foot and 6-foot shoulders, and 8 to 1 pavement slopes. Design speed is 30 mph climbing out of the canyon, and 40 mph after the proposed highway comes out on top in easier terrain. These criteria are considered adequate by Federal Highway Administration since the prime use of this road will be recreational. The relocation will be about 15 miles in length. A sketch of the general route follows.

Several alternate locations have been studied but have been rejected due to soil conditions, construction difficulty, or adverse economics.

Full bench section on the canyon walls will eliminate sliver fills. Adjustment of the profile grade to better fit the terrain, topsoiling, seeding, and landscaping will be performed.

The Company has a contract with the State of Utah covering the road relocation. FHWA will award the construction contract following the filing of the final Environmental Statement.

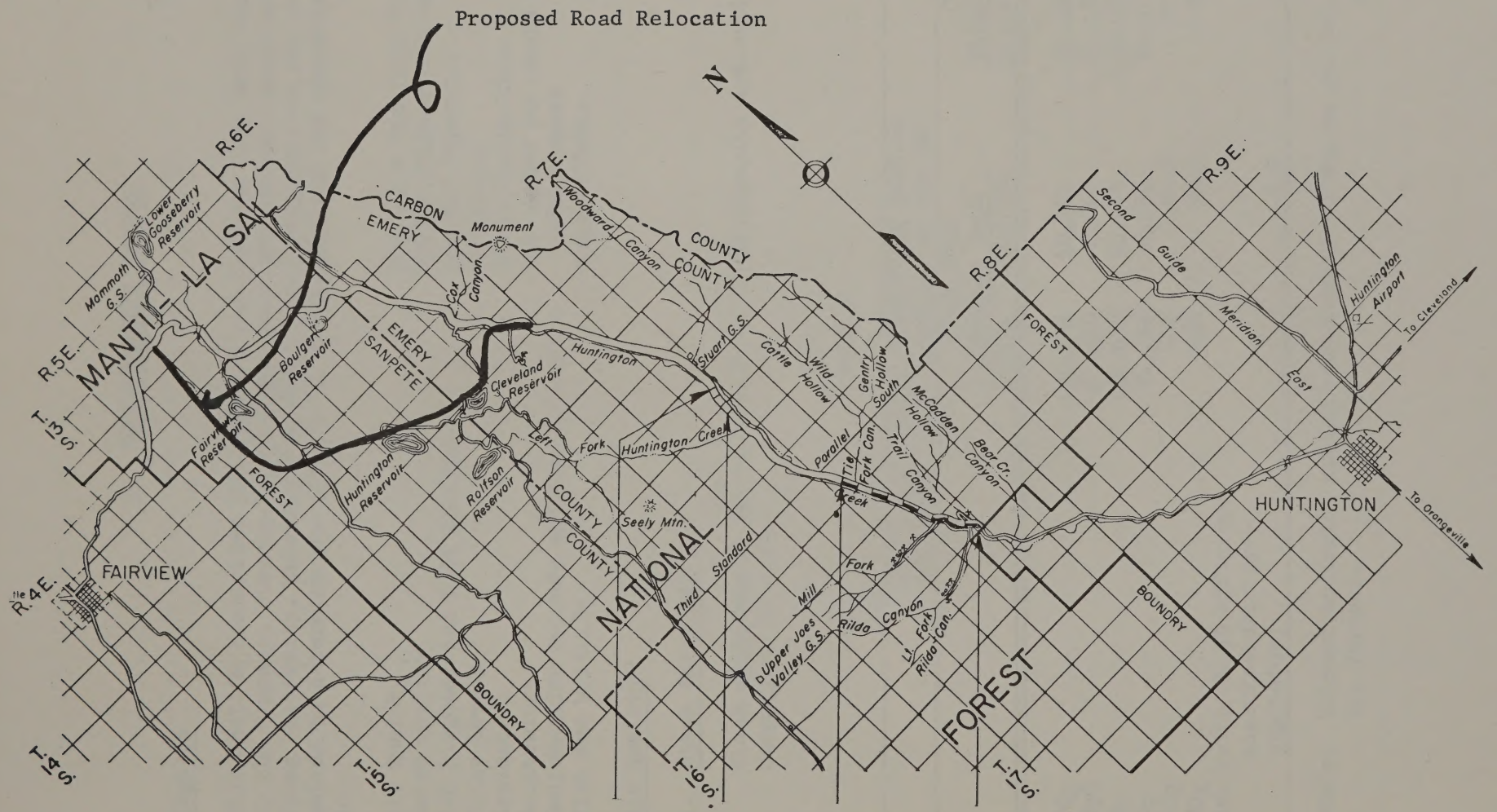
2.4 Socio-Economic Factors

The Station will provide a significant economic impact in the Carbon and Emery County areas.

The construction force is expected to peak out at approximately 500 men during the construction of the first unit. In 1974 when the 430-MW unit begins generating electricity, 44 men will operate the Station. The mining operation serving the Station is expected to require approximately 200 men by 1974.

In addition to added employment, the first unit alone will double the tax base of Emery County. In 1970, the Company paid $54,719 in property taxes to the County. The amount will jump to some $710,000 in 1973, and when the first unit of the Station is completed in 1974 property taxes are expected to be over $1,000,000 per year. Additional units, as constructed, will provide proportional increases in the economy of the County.

MANTI-LA SAL NATIONAL FOREST
EMERY COUNTY



FAIRVIEW-HUNTINGTON CANYON

3. ENVIRONMENTAL IMPACT

3.1 Impacts

This section summarizes the research and planning that have been accomplished by the Company, Stearns-Roger, North American Weather Consultants, Brigham Young University, University of Utah, and consultants to the Bureau of Reclamation to determine the effects of the project and its operation with respect to:

Air Quality
Water Quality
Ash Disposal and Dust Abatement
Noise Levels
Aesthetics
Archaeology
Radionuclide Release and Trace Elements
Fish and Wildlife
Coal Mine and Coal Conveyance
Forest Highway Relocation
Dam and Reservoir
Recreation
Transmission Line
Man-caused Accidents and Natural Catastrophes
Other Effects

3.1.1 Air Quality

1. Stack Emissions

Stack emissions at 430-MW and at 2,000-MW capacity are estimated by the Company as follows:

TABLE 1

Huntington Canyon Generating Station
Estimated Stack Emissions at 430-MW

	Coal from Hiawatha Seam		Coal from Blind Canyon Seam	
	p.p.m.	Tons/day	p.p.m.	Tons/day
CO_2	136,101	10,187	134,062	9,948
H_2O	67,250	2,060	69,154	2,085
N_2	754,636	35,944	754,953	36,107
O_2	41,146	2,239	41,073	2,209
*SO_2	417	44.8	308	32.9
*NO_x	450	36.0	450	35.3
Ash (with 99.5% efficient electrostatic precipitator)		1.4		.9

*Note: Without controls, except such control of NO_x as can be effected in the furnace.

TABLE 1A

Huntington Canyon Generating Station nn
Estimated Stack Emissions at 2,000-MW

	Coal from Hiawatha Seam		Coal from Blind Canyon Seam	
	p.p.m.	Tons/day	p.p.m.	Tons/day
CO_2	136,101	47,380	134,062	46,268
H_2O	67,250	9,580	69,154	9,678
N_2	754,636	167,175	754,953	167,930
O_2	41,146	10,410	41,073	10,275
*SO_2	83	41.6	62	30.6
**NO_x	450	167.4	450	164
Ash (with 99.5% efficient control)		6.0		4.2

*80% control of SO_2 to comply with Utah Implementation Plan.
**Without controls except such controls of NO_x as can be effected in the furnace.

Appendix A-27 is an excerpt from the EPA standards of performance for new stationary sources. Although these standards are not directly applicable to the first unit of this Station, they afford useful information on the emission standards which EPA will require on new sources. The standards would not be exceeded according to the criteria in EPA Technical Report No. 1--Steam Generators--which was a part of the background information published by EPA on new-source performance standards in August 1971.

2. Estimated Relative Air Quality

According to consultants of the Company, equations available for modeling the diffusion of a plume released from an elevated smokestack assume that the terrain downwind from the stack is level. When the downwind terrain is not level, as in the Huntington Canyon site situation, interpretation of the results of modeling computations becomes complex. A conservative assumption is that elevated terrain receives a concentration on its surface equal to that which would exist at the same coordinates within a diffusing plume were it flowing over level terrain. Use of this assumption might result in computed concentrations which exceed what would be actually observed over the elevated terrain because of the effects of daytime heating of the canyon walls. Observations of flow-over models of mountain terrain in low-speed wind tunnels suggest that streamlines can be deformed upward by elevated terrain and do not always impact the terrai at free air elevation. In addition to the complications introduced by irregular terrain, modeling results include other uncertainties. The final results are subject to wide-ranging variation, depending on what plume rise equation is used, and what assumptions are made concerning the stability of the atmosphere.

Included in the Appendix (A-7) is an excerpt from the February 1971 report of the Utah Engineering Experimental Station Center for Environmental Studies, University of Utah, covering its monitoring and testing program and its results to March 1, 1971. The objective of the study[3] is to establish the influence of the Station on ambient air quality.

North American Weather Consultants prepared a report on a meteorological evaluation of dispersion of stack effluent[9] which gives additional information on this general subject.

At the request of the Bureau of Reclamation, air quality experts of the Tennessee Valley Authority made independent modeling studies of diffusion to be expected southeast of the Station site on the premise that the Station would be the only major source of air pollutants. A copy of the data furnished TVA for these studies is included in the Appendix (A-6).

Table 2 presents the TVA estimate of what the ambient air quality will be under the "Limited Mixing Layer Model" conditions 2 miles from the Station.

By comparison with Federal and State of Utah ambient air standards (Appendix A-22, A-23, and A-24), the estimated relative air quality will not be in violation of existing ambient air standards.

3. Particulates

Proposals were requested by the Company, and an analysis and appraisal were made by Stearns-Roger on three types of particulate removal equipment:

(a) Electrostatic (hot end)

(b) Electrostatic (cold end)

(c) Scrubbers

The Company has ordered an electrostatic precipitator (cold end) for the first unit. The manufacturer has guaranteed an efficiency of 99.5% particulate removal which the Company expects will meet Federal and State air quality standards.

As shown in Table 1, the estimated particulate emissions for a 430-MW unit will be from 0.9 to 1.4 t.p.d. with a 99.5% efficient precipitator. This would result in an ambient concentration of approximately 4.4 $\mu g/m^3$ (1-hour average), well below the Federal and State standards. As shown in Table 1A, the estimated particulate emissions for a 2,000-MW unit will be from 4.2 to 6.0 tons per day with 99.5% efficient collection equipment. This would result in an ambient concentration of approximately 22 micrograms per cubic meter (1-hour average) well below Federal and State Standards.

TABLE 2

HUNTINGTON CANYON GENERATING STATION - ESTIMATED RELATIVE AIR QUALITY

MAXIMUM 1- AND 24-HOUR AVERAGE CONCENTRATIONS

(TVA)

	($\mu g/m^3$)				p.p.m. (Volume)			
	430-MW		2,000-MW		430-MW		2,000-MW	
Constituent	1-Hour	24-Hour	1-Hour	24-Hour	1-Hour	24-Hour	1-Hour	24-Hour
SO_2	154	22	604	87	0.069	0.010	0.27	0.039
SO_3	2.1	0.31	8.3	1.2	0.00077	0.00011	0.0030	0.00043
NO_x as NO_2	189	27	739	107	0.12	0.017	0.47	0.068
CO_2	45150	6543	176674	25520	30	4.3	117	17
O_2	9876	1431	38647	5582	9.0	1.3	35	5.1
N_2	125836	18237	492402	71125	131	19	515	74
H_2O as vapor	7093	1028	27753	4409	12	1.7	45	6.5
Fly Ash 99.5% Removal	5	1	18	3				

The above estimates were arrived at without considering the effect of air quality control features, except for particulates, and such control of NO_x as could be achieved in the furnace design. The Utah Implementation Plan Encompassing a Mechanism and Schedule for Achieving Existing Ambient Air Quality Standards Throughout the State would require 80% removal of SO_2 on new sources (presumably after first unit).

Some scientists contend that even with a high percentage of control of particulates by electrostatic precipitators, the particulates which are emitted contain submicron particles that are the principal agent in reducing visibility due to stack emissions, and could be a health hazard. The magnitude of these effects has not been well defined or assessed by scientists. A report by the Utah Engineering Experiment Station, dated February 29, 1972, on the subject of the contribution of fly ash to light scattering and visibility in the vicinity of the Station[12] concluded that:

> "Based on these calculations it is anticipated that the effects of meteorological conditions and fly ash on visual range will not be noticeable over the background dusts. When the plant reaches its full 2,000-MW capacity there might be some slight haziness under the extreme canyon trapping case. However, because of the short observation distances in the canyon (in many cases less than one mile) and the predicted short duration of only about two hours for the condition, this effect will hardly be noticeable.
>
> "These calculations are based on the assumption that the distribution of particle sizes for fly ash will be similar to those at the Four Corners plant for sizes below 5 microns, and that the precipitators will be effective in reducing fly ash to this range. There may be some variation in the results presented depending on actual performance, but these can be readily estimated when further data are available. No significant change would be expected for minor variations in the performance."

Table 26 of Appendix E of the Southwest Energy Study[14] shows visual range related to maximum one-hour concentrations of particulates for the Station as follows:

3 km North of Station (elevated terrain with one or two units), particulate visual range (km) = < 1

11 km ESE of Station (with one unit) particulate visual range (km) = 25
with two units = 12

The differences between the two assessments of visibility effects shown above are principally due to the differences of opinion of qualified meteorologists as to impacts of emission on elevated terrain. The Southwest Energy Study referred to states:

> "It should be noted that the considerable degradation of visibility when plume centerlines are affected by higher terrain is quite localized and is estimated to have a frequency of occurrence on the order of about 1 percent."

Table 4 shows NOAA's computation of particulate concentrations at various locations both annually and for short-term episodes. The premises used by NOAA in computing the high short-term concentrations on high terrain are explained under the following section on SO_2.

Recommendations have been made by some observers that baghouses (filters) be installed in series with electrostatic precipitators to trap the submicron particles. The experience with baghouses on large-capacity generating stations burning coal is extremely limited, and the cost of installing in-series baghouses could well be prohibitive without further advances in technology. Baghouses were tentatively planned for installation on two 755-MW units at the Four Corners Generating Station in series with electrostatic precipitators, but this proposal is presently being reevaluated The Company's plans at this time do not envision the use of baghouses at its Station

4. Sulfur Dioxide

TVA modeling procedures resulted in the following estimates of SO_2 ground concentrations southeast of the Station:

TABLE 3

Estimated 1-Hour Average Maximum Concentrations of SO_2

Stack Height	Coning Model			Inversion Breakup Model			Limited Mixing Layer Model		
	Concentration		Distance	Concentration		Distance	Concentration		Distance
(feet)	(p.p.m.)	(µg/m3)	(mi)	(p.p.m.)	(µg/m3)	(mi)	(p.p.m.)	(µg/m3)	(mi)
				430-MW Capacity					
600	.010	22	2.0	.030	67	7.0	.069	154	2.0
				2,000-MW Capacity					
600	.06	130	2.0	.10	220	7.0	.27	604	2.0

Note: The mean daily concentration will not exceed 25% of the above values 95% of the time.

As a direct comparison with State and Federal standards, the proposed State standard permits an ambient SO_2 concentration of 0.1 p.p.m. as a 24-hour average. The Federal standard permits an ambient concentration of 0.14 p.p.m. as a primary standard and 0.1 as a secondary standard.

North American Weather Consultants analyzed data collected in its meteorological program by computer programs which predict what SO_2 concentrations could be expected at various distances from the Station on the basis of the meteorological and engineering data fed into them. The effects of using several different engineering parameters, such as stack

height, effluent SO_2 concentration, and gas exit velocity, were computed under varying observed atmospheric conditions. Estimates were formed of the frequency with which certain maximum SO_2 concentrations could occur. On the basis of these computations, using accepted numerical dispersion models and a recommended 600-foot stack height, the NAW estimated that the SO_2 ground concentration values from the first 430-MW unit without controls would be as follows:

(a) Annual Average Values (See Figure 1 following)

The maximum annual average SO_2 ground concentration level is estimated not to exceed 0.003 parts per million (p.p.m.) by volume at any distance from the Station. This is about one-seventh of the 0.020 p.p.m. allowed by the proposed State regulation.

(b) Daily Average Values (See Figure 2 following)

A maximum daily average SO_2 ground concentration level of 0.013 to 0.016 p,p.m. can be expected within the nearest 3 miles of the Station. This is only one-sixth of the .10 p.p.m. allowed by the proposed State regulation.

(c) Half-hourly Values (See Figure 3 following)

A maximum half-hourly SO_2 ground concentration level of 0.10 p.p.m. can be expected within the nearest 2 miles of the Station. The proposed State regulation permits a half-hour concentration of 1.00 p.p.m. to occur up to twice in one day, and .50 p.p.m. up to 5 times per day, and the computed maximum values are well below these limits.

At 2,000-MW capacity, the ground concentration levels would be approximately 7% lower assuming 80% removal of SO_2 to meet the Utah Implementation Plan and still well below the State regulation with this level of control.

The values presented in Figures 1-3 are based upon the meteorological conditions which are found to prevail in the canyon. The study shows that the site is unique in that during much of the time either strong down-canyon or up-canyon winds prevail, thus enhancing the power of the atmosphere to disperse any effluent introduced into it.

The analysis, however, also shows the potential of limited dispersion under stable winter air mass conditions with low-wind speeds. A test comparing general meteorological conditions over Utah during a 10-year historical period with those which occurred during the sampling period showed that the prevalence of conditions favoring restricted dispersion of effluent during the 15 months of observations occurred with about the average frequency found during the 10 historical years. The average occurrence is 6 periods per year of 2-4 days' duration.

No standard evaluation techniques are presently available for plume dispersion under this condition; however, a special analysis was made by

NAW based upon a simple mixing model, though better definition of meteorological parameters is required for such computations than could be obtained during the 1970-71 field trips.

The computational results for one unit is presented in Figure 4 which follows, showing peak values ranging between 0.09 p.p.m. and 0.36 p.p.m. These were all of short duration and limited to the 1- to 2-hour periods following the transition to up-canyon flow. Estimates of maximum daily average SO_2 values indicate that they would fall well within the State limits, even during the most adverse mixing conditions encountered at the site.

Furthermore, the contribution to the annual SO_2 average values in Figure 1 would be insignificant in view of the low yearly frequency of occurrence of this condition.

The computational results presented in Figures 1-4 are based upon atmospheric dispersion processes only, with no consideration given to plume deposition or sink effects associated with the surrounding vegetation. The latter may be of particular importance in removing SO_2 from the air during stagnant conditions.

NAW concluded that on the basis of the meteorological conditions observed and the proposed engineering design features, the maximum concentrations of SO_2 which could be expected at ground level downwind of the first unit and with 80% removal of SO_2 at 2,000-MW capacity on subsequent units, would be far below the limits allowed under Federal and State regulations.

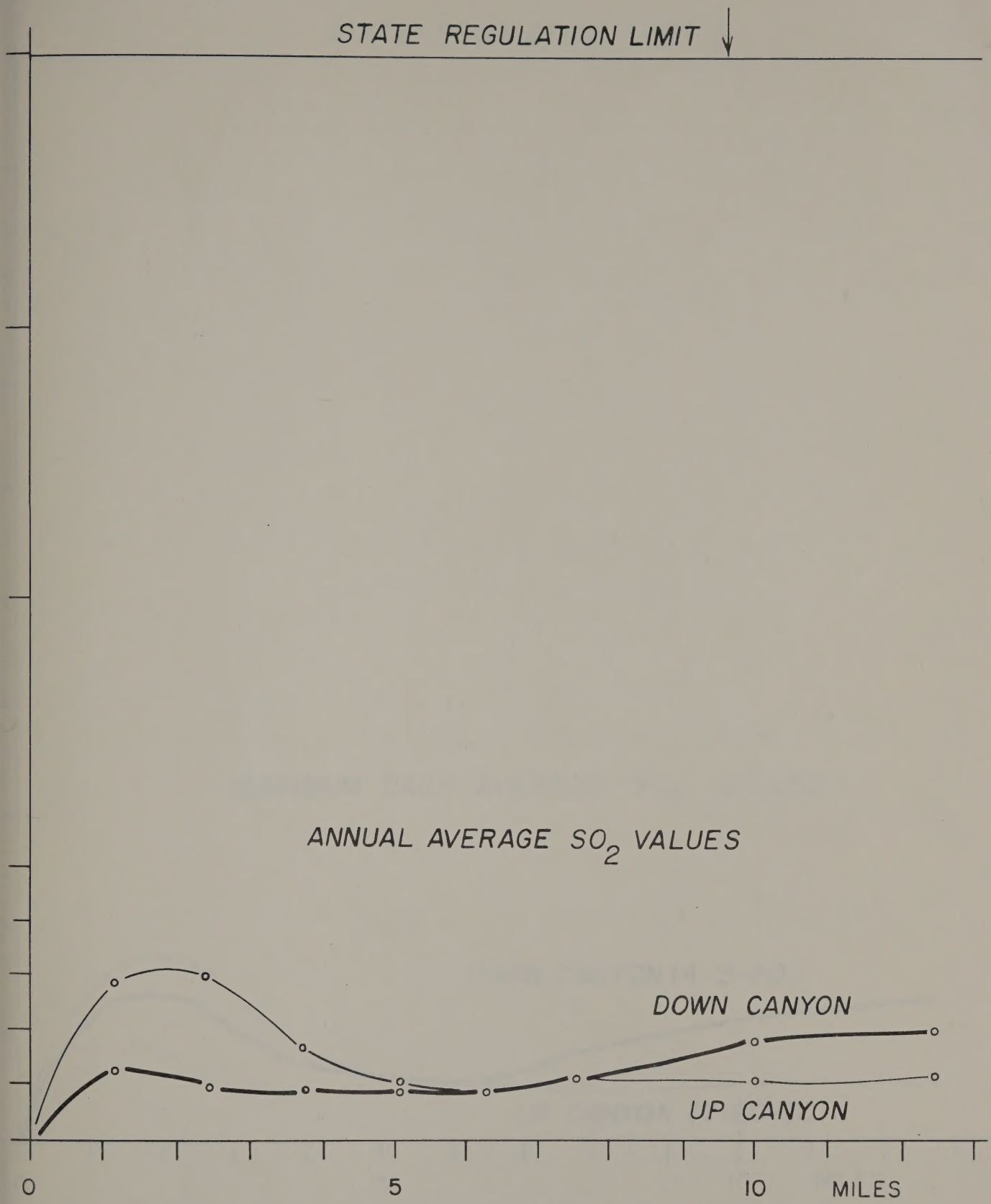


Figure 1. Annual average SO_2 concentration values versus distance from a single unit with a 600-foot stack based upon 1970-71 meteorological data. The values were estimated from the annual frequency distribution of dispersion conditions within a 40° sector for up-canyon and 30° sector for down-canyon flow. The curve would be approximately 7% lower for the 2,000-MW case with 80% SO_2 removal. (North American Weather Consultants)

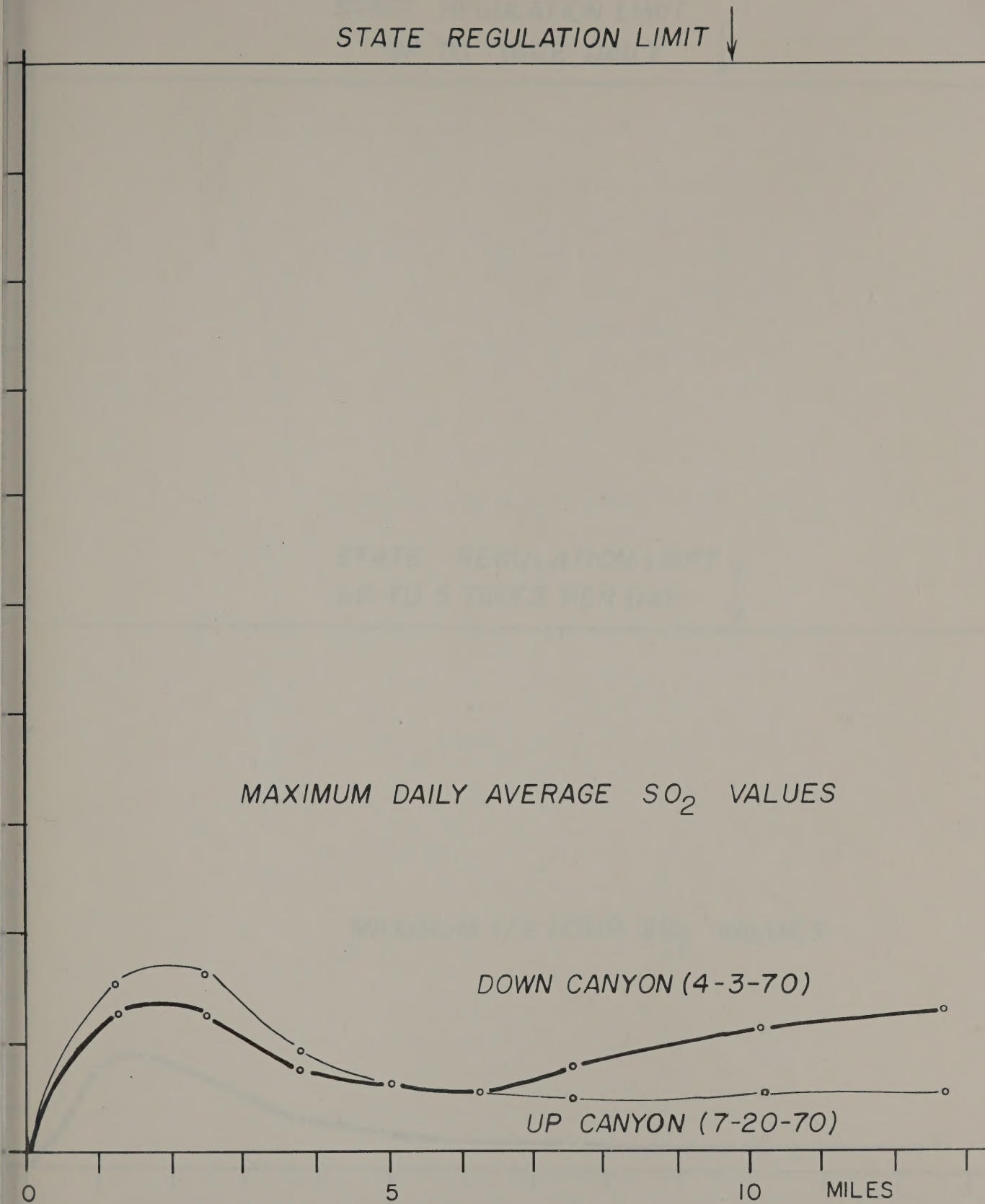


Figure 2. Maximum daily average SO_2 concentration values versus distance from a single unit with a 600-foot stack. The values were estimated by assuming the plume centerline remaining along a constant direction for the most persistent 24-hour condition which could be found for up- or down-canyon flow (respectively July 20, 1970, and April 3, 1970). The curve would be approximately 7% lower for the 2,000-MW case with 80% SO_2 removal. (North American Weather Consultants)

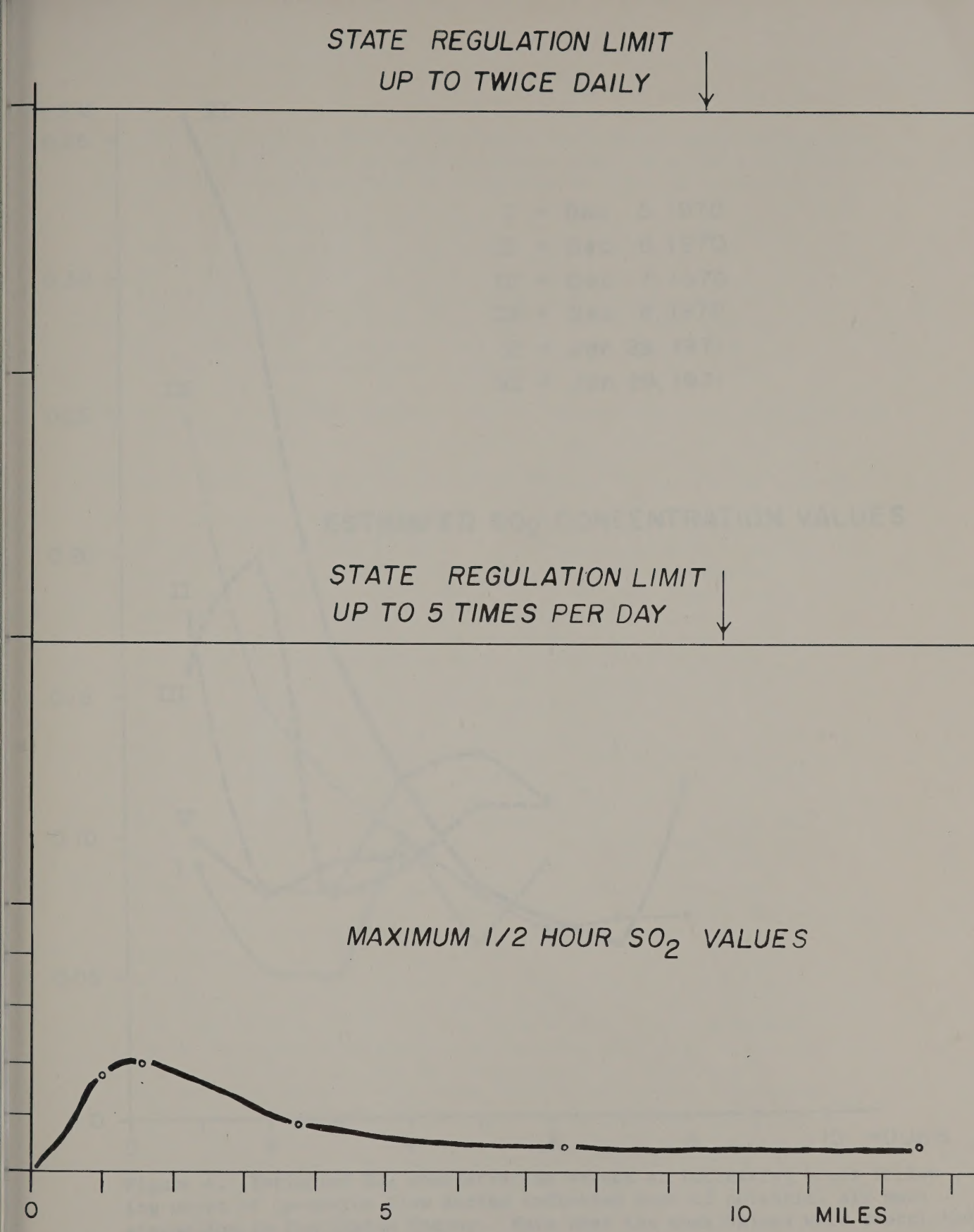
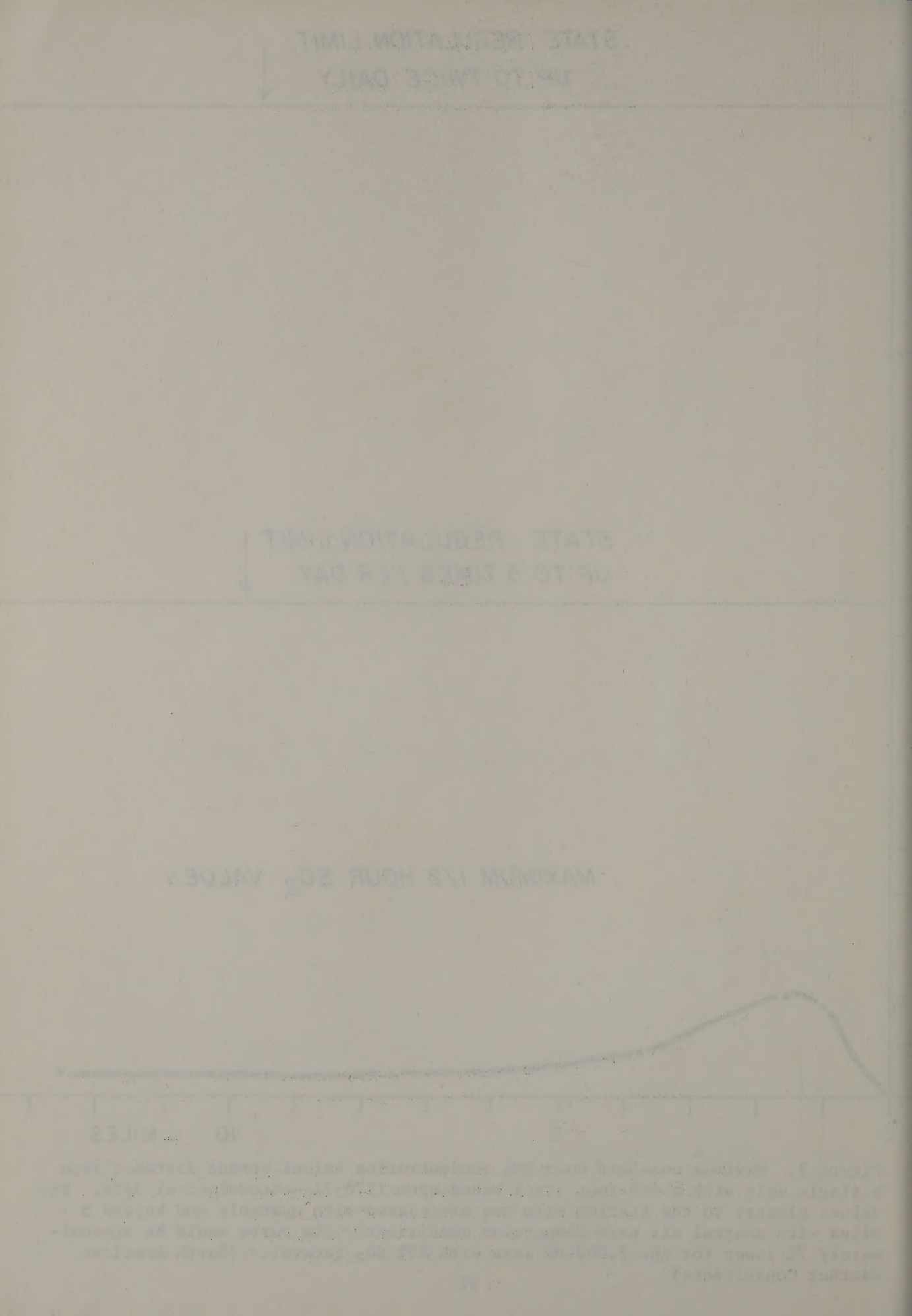


Figure 3. Maximum one-half hour SO_2 concentration values versus distance from a single unit with a 600-foot stack based upon 1970-71 meteorological data. The values closest to the Station site are associated with unstable and beyond 5 miles with neutral air mass dispersion conditions. The curve would be approximately 7% lower for the 2,000-MW case with 80% SO_2 removal. (North American Weather Consultants)



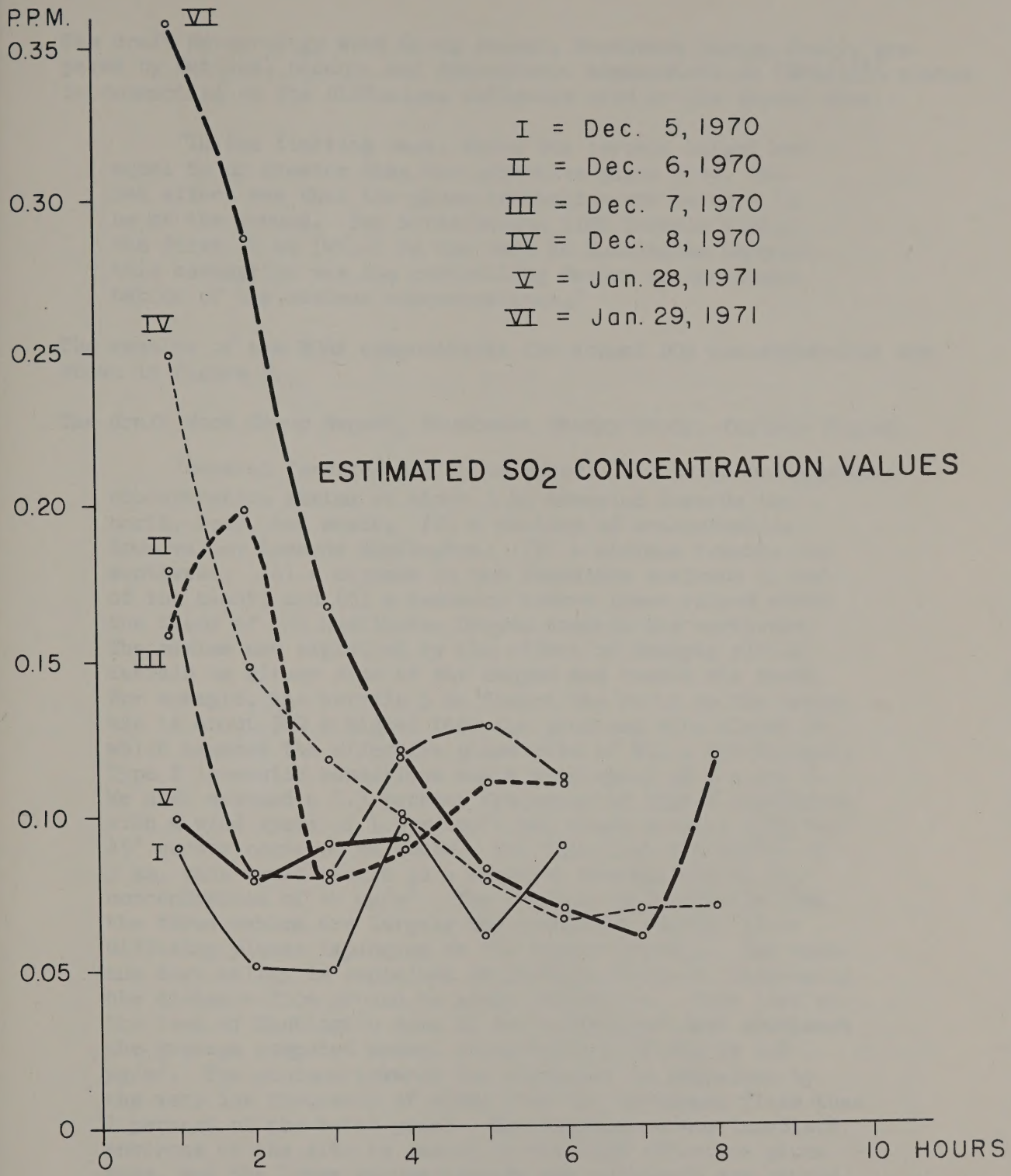
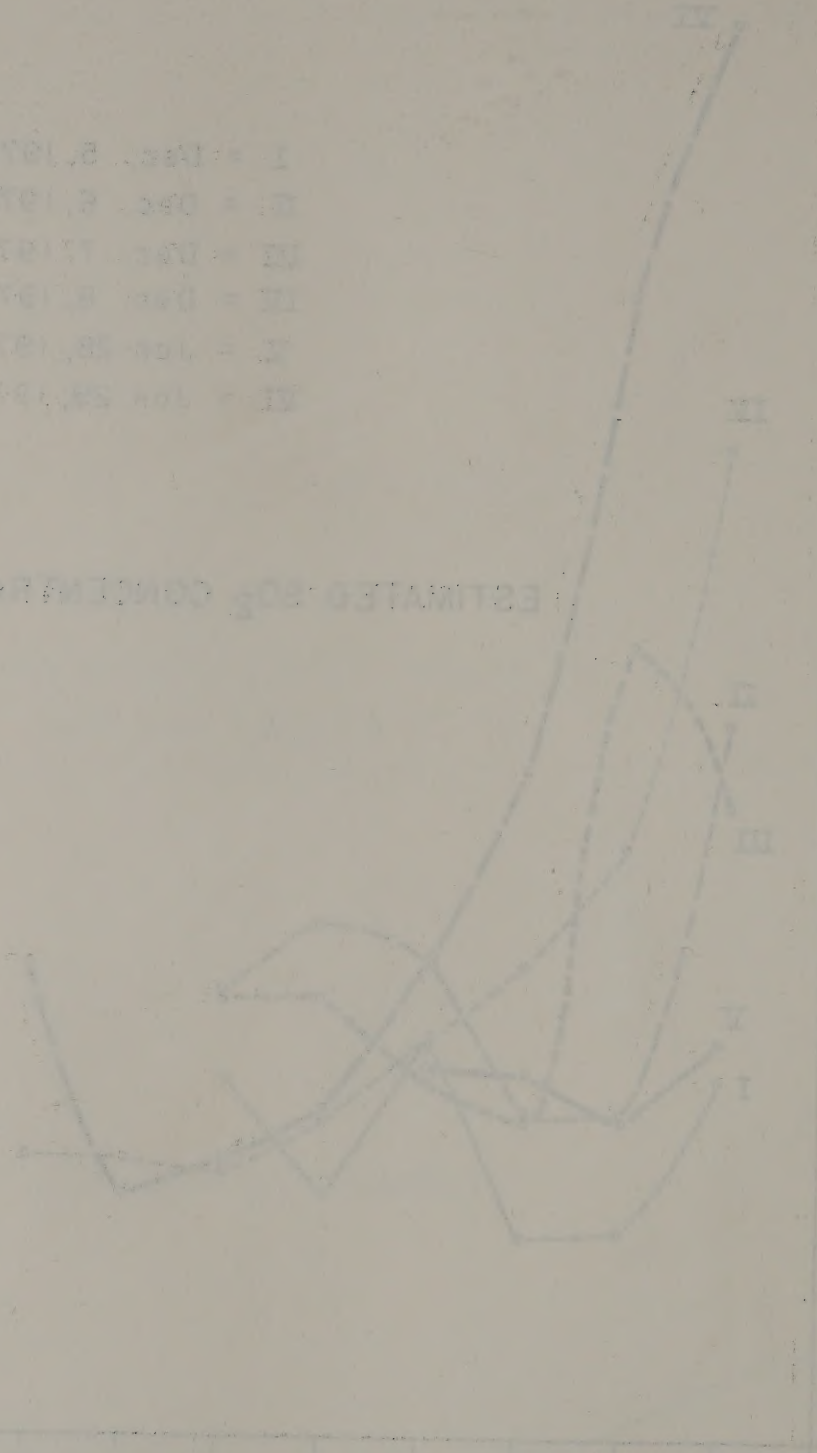


Figure 4. Estimated SO_2 concentration values at increasing hours following onset of up-canyon flow during indicated days of potential air mass stagnation in Huntington Canyon. Note that the peak values were restricted to short periods around the transition in canyon flow. Curves are for a 430-MW unit with no SO_2 removal. At 2,000-MW with 80% SO_2 removal, the curves would be approximately 7% lower. (North American Weather Consultants)



The draft Meteorology Work Group Report, Southwest Energy Study, prepared by National Oceanic and Atmospheric Administration (NOAA)[14], states in commenting on the diffusions estimates used in its report that:

> "In the limiting case, where the terrain height was equal to or greater than the effective plume rise, the net effect was that the plume centerline was assumed to be at the ground. For sites having high terrain within the first 10 km (which is the case at Huntington Canyon), this assumption was the controlling factor in the computation of the maximum concentrations."

The results of the NOAA computations for annual SO_2 concentrations are shown in Figure 5.

The draft Work Group Report, Southwest Energy Study, further states:

> "Several features are to be noted: (1) three well-defined concentration maxima at about 3 km downwind towards the north, west, and south; (2) a minimum of concentration down valley towards Huntington; (3) a minimum towards the southwest; (4) a minimum in the immediate environs (1 km) of the plant; and (5) a tendency toward lower values above the floor of the Huntington Canyon towards the northwest. The maxima are explained by the effect of sharply rising terrain on either side of the canyon and toward the south. For example, the terrain 3 km toward the north on the average is about 500 m higher than the proposed site elevation, which negates the effective plume rise of 410 m for Pasquill Type F inversion conditions and a wind speed of 1 m sec^{-1}. We have assumed a 1.3 percent frequency of Type F conditions with a wind speed of 1.5 m sec^{-1} and winds flowing <u>from</u> the 45° sector centered on south. For Unit 1 at a distance of 3 km, this would result in a computed average annual SO_2 concentration of 40 $\mu g/m^3$. The obvious conclusion is that the three maxima are largely the result of stable, slow-diffusing plumes impinging on the higher terrain. The minimum down valley is explained by lowering terrain, increasing the distance from ground to plume centerline. Note that at the town of Huntington some 11 km towards the east southeast the average computed annual concentration of SO_2 is 0.2 $\mu g/m^3$. The minimum towards the southwest is explained by the very low frequency of winds from the northeast (less than 1 percent of the total year). The minimum in the immediate environs of the site is caused by the high effective plume rise, and the lower values towards the northwest are caused by the lower elevations of the canyon floor.
>
> "In summary, from this analysis, it is concluded that lower annual concentrations can be expected down valley towards Huntington, and the highest concentrations can be expected on the east side of the canyon approximately 3 km to

the north northeast. Assuming an average power load of 85 percent for the year, the annual average concentrations of SO_2, NO_x, and particulates are shown in Table 4 for Huntington and for the point of maximum concentration."

Table 4 also shows short-term maximized computed concentrations for 1-hour and 24-hours at various locations prepared by NOAA. These computed maxima are based on the above stated premises, and on NOAA's assumptions that another mechanism that would maximize concentrations is a trapping of the plume within the canyon wall and with a limited mixing depth.

In analyzing the estimates of ambient SO_2 concentration that have been made by TVA, consultants employed by the Company and by NOAA as a part of that agency's participation in the Southwest Energy Study, the following conclusions have been reached by the Bureau of Reclamation.

The various estimates were based on mathematical models of dispersion applied with that degree of constraint that each individual modeler's experience dictated. TVA's air quality experts estimated concentrations in the down-canyon direction only, based on their recognition that down-canyon flow would be the most likely movement of air under stable conditions, and that the widely accepted dispersion models assume level terrain and, hence, are not strictly applicable to the estimation of concentrations produced on elevated terrain.

The consultants to the Company, recognizing the utility of estimates of surface concentration under conditions of both down-canyon and up-canyon flow, made the assumption that the plume centerline would be deformed upward as stable air underlying the plume was lifted by flowing up-canyon over elevated terrain. They then applied a simple mixing model and arrived at their estimates of surface concentrations along lines extending 13 miles up-canyon and down-canyon from the plantsite. The concentrations computed in this manner fell below limits set by the Air Quality Regulations of the State of Utah.

The NOAA study sought to identify the upper limit of possible surface concentration. It assumed that under extremely stable conditions the plume centerline could impact the high terrain directly across the canyon 3 kilometers from the plantsite with no elevation of the plume centerline as the plume approached the canyon wall. Concentrations of SO_2 computed by NOAA for the case of plume impaction on a point 3 kilometers NNE of the plantsite are approximately 10 times the concentrations permitted by Air Quality Regulations of the State of Utah for a 24-hour period and 20 times the half-hour value. To support the reasonableness of their computations, the NOAA authors cite a study of elevated plumes from smelter operations in the Columbia River Valley at Trail, British Columbia. They offer as supporting evidence a cross section of that valley showing a maximum concentration of 0.73 p.p.m. This value was obtained by sampling equipment aboard an aircraft flying near the steep west wall. A surface concentration of this magnitude

TABLE 4

Annual Average Computed Concentrations, Huntington Canyon

Location	SO_2 (μ grams m^{-3})		NO_x (μ grams m^{-3})		Particulate (μ grams m^{-3})	
	Unit 1	Units 1+2	Unit 1	Units 1+2	Unit 1	Units 1+2
Huntington (11 km ESE)	0.2	0.4	0.2	0.4	0.01	0.02
Maximum (3 km NNE)	45	90	40	80	2.9	5.8

Maximized Computed Concentrations for One Hour and Twenty-four Hours*, Huntington Canyon

Location	X/Q (sec m^{-3})	SO_2 (μ grams m^{-3})		NO_x (μ grams m^{-3})		Particulates (μ grams m^{-3})	
		Unit 1	Units 1+2	Unit 1	Units 1+2	Unit 1	Units 1+2
High terrain,	1.4×10^{-4}	52,000	104,000	48,000	96,000	3,300	6,600
3 km NNE	(7×10^{-6})	(2,600)	(5,200)	(2,400)	(4,800)	(170)	(340)
Canyon trapping,	1.5×10^{-6}	560	1,120	510	1,020	37	74
8 km NW	(6×10^{-7}	(220)	(440)	(210)	(420)	(15)	(30)
Bear Creek,	4×10^{-7}	150	300	137	274	10	20
2.5 km NW	--	--	--	--	--	--	--
Huntington,	2×10^{-6}	750	1,500	680	1,360	50	100
11 km ESE	(8×10^{-8})	(30)	(60)	(28)	(56)	(2)	(4)

*24 hours in parentheses

(Report of the Meteorology Work Group - Southwest Energy Study)

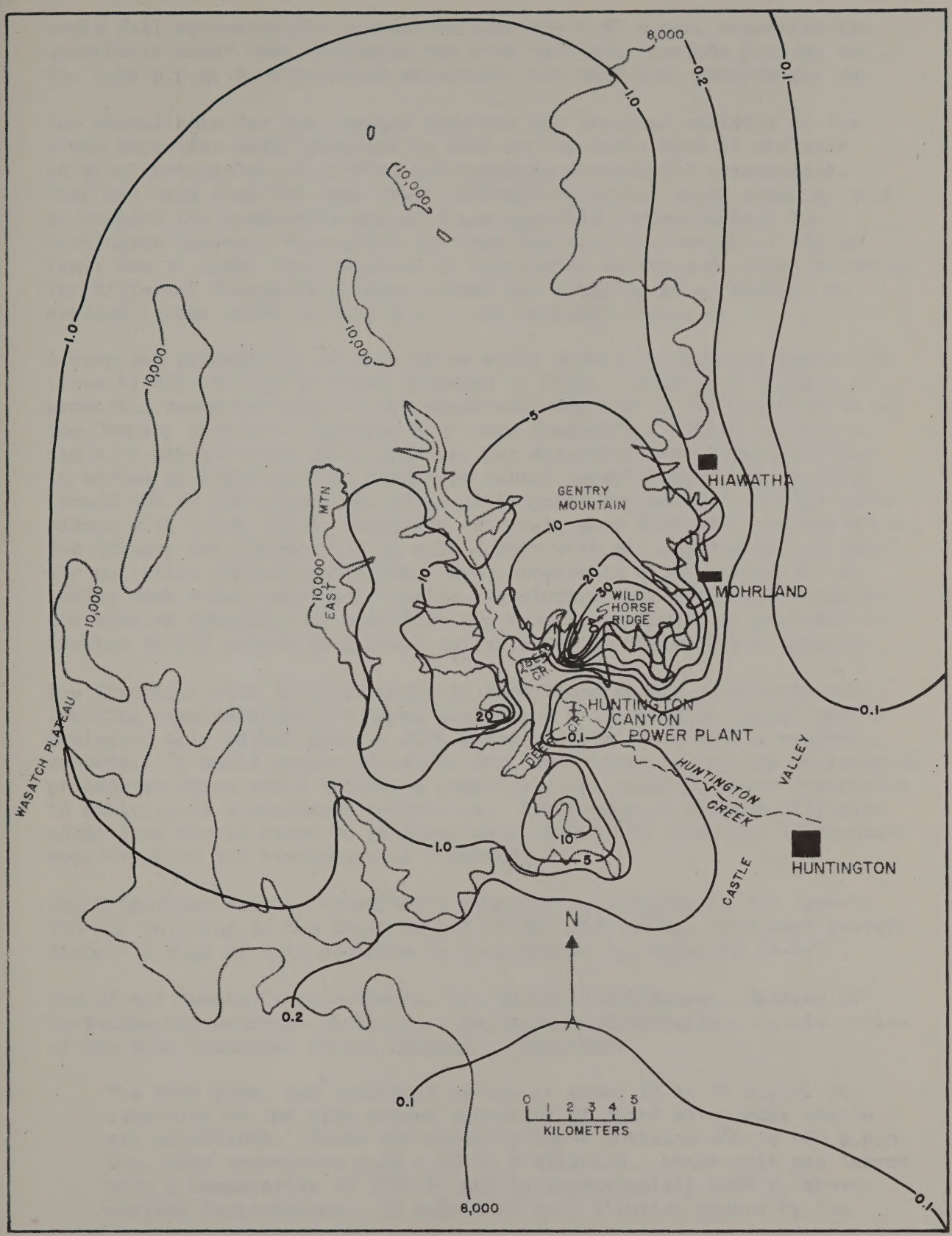
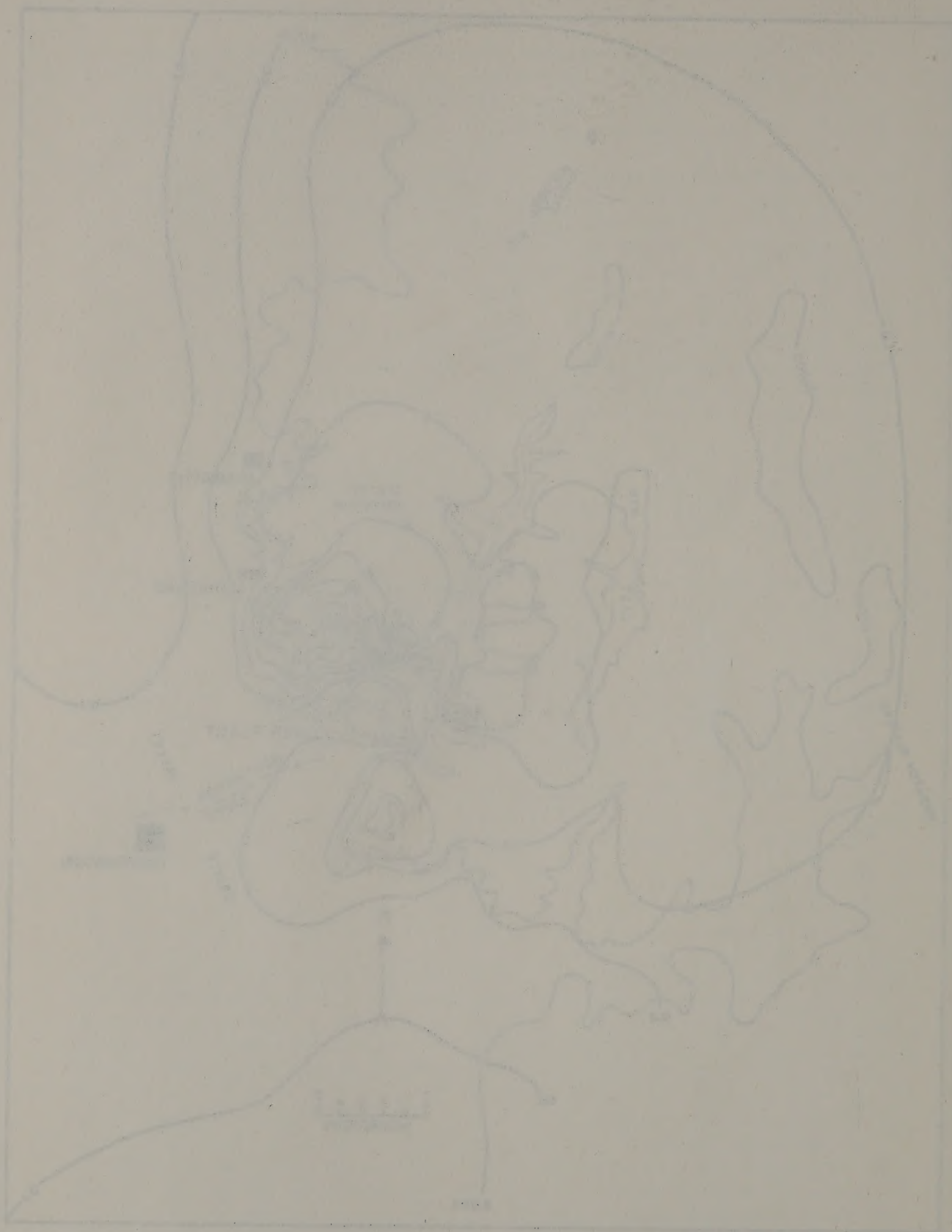


Figure 5. Computed average annual SO_2 concentrations ($\mu g/m^3$) for Huntington Canyon #1. (Report of the Meteorology Work Group - Southwest Energy Study)



would fall approximately halfway between the 0.50 p.p.m. concentration acceptable under Utah standards for five half-hour periods per day and the 1.00 p.p.m. concentration acceptable two half-hour periods per day.

The consultants for the Company question the physical validity of the plume impaction model proposed by NOAA on the basis that it violates physical principles of airflow and involves unrealistic assumptions. They use data from the same Trail, British Columbia, study cited by NOAA to support the reasonableness of their computed concentrations for Huntington Canyon. They point out that the source strength of SO_2 at Trail was 10 times that expected at Huntington Canyon and, after allowing for different distances between source and sampling site, predict an average 1-hour value of 0.29 p.p.m. for Huntington Canyon.

A very low probability of occurrence would appear to apply to concentrations of SO_2 as high as those computed by NOAA. Conditions capable of producing concentrations of the magnitude computed by the consultants to the Company should be expected much more frequently. There is little basis in present knowledge, however, for asserting that concentrations in excess of State of Utah standards cannot possibly occur on the high ground NNE of the plantsite, given anticipated SO_2 emission levels coincident with cross canyon winds and extremely poor diffusion circumstances. The Company has stated that it will comply with all applicable and valid air pollution control standards. Two conceivable alternatives for insuring such total compliance during restrictive meteorological episodes are routine operation of effective SO_2 removal equipment or periodic reduction of SO_2 output to a level suitable to the atmosphere's capacity.

The frequency with which atmospheric conditions should constitute the limiting consideration for power generation at Huntington Canyon can be estimated only rather grossly with presently available onsite weather records. It would appear advisable for the Company to develop operational procedures which would include a capability for relating power generation to anticipated atmospheric conditions. Prediction of adverse diffusion conditions should prove to be acceptably timely and reliable, if adequate monitoring of the atmosphere is provided.

North American Weather Consultants prepared an addendum to its report 706-A9/ relating to the draft report of the Work Group, Southwest Energy Study. A copy of this addendum is included in the Appendix (A-42).

One of the Company's consultants, Dr. Robert Christiansen, Manager of Environmental Sciences Division, Stearns-Roger Corporation, in his review of the NOAA Southwest Energy Study14/, commented:

> The NOAA study has indicated values of about 18 to 20 p.p.m. SO_2 impacting on the high ground northeast of plant site under stable air conditions. Since the stack effluent contains 380 to 400 p.p.m. SO_2, this represents only a 20 to 1 dilution. Stack exit gas leaves with a temperature of 260° F. and is approximately 200° F. above ambient temperatures. If only a 20 to 1 dilution occurs by the

time the gases reach the high ground to the northeast, then the gases would still be 10° higher than ambient temperature. Under these conditions, we could not have a stable air mass and further rise and dilution must occur. Therefore, we cannot agree with the model proposed by NOAA. For stability, we would expect at least 200-fold dilution and perhaps 1000-fold dilution as a bare minimum. This would give a temperature elevation of 1° or 0.2° respectively. Under these conditions, we could begin to realize a stable air mass. However, we would then expect SO_2 levels of 2 p.p.m. or 0.4 p.p.m., respectively, in contrast to NOAA's 18 to 20 p.p.m.

Recognizing the low frequency of occurrence used by NOAA, 1 percent of the time, these levels, 0.4 to 2 p.p.m., we believe are not harmful to vegetation and that State and Federal standards will be complied with at all times.

TVA, serving as consultant to the Bureau of Reclamation in this respect, commented on the NOAA study[14]. Its comments are included in the Appendix (A-52). TVA differed with the NOAA study in several respects as noted in its comments.

5. Nitrogen Oxides

Table 1 shows the estimated emission of NO_x as 35.3 to 36.0 t.p.d. for a 430-MW unit and 164 to 167.4 t.p.d. at 2,000-MW capacity. Tables 2 and 4 show TVA and NOAA estimates of NO_x concentrations. The computed concentrations in both instances on an annual basis are well below the national primary and secondary standard of 100 $\mu g/m^3$. No practical means of controlling NO_x emissions for generating stations of this size have been developed, other than such control as can be effected through improved boiler designs. The boiler will utilize a tangential firing pattern and overfire air ports, which are thought to be instrumental in reducing NO_x formation.

6. Cumulative Impact Considerations

Major electric generating stations under construction, planned, or in operation in parts of Utah, Nevada, Arizona, New Mexico, Colorado, and Wyoming are shown on the map in the Appendix (A-33). Ultimate planned capacity of certain of these generating stations is:

Kaiparowits (in planning stage) - ultimate planned capacity 5,000-MW
San Juan (under construction) - ultimate planned capacity 1,690-MW
Navajo (under construction) - ultimate planned capacity 2,300-MW

Much attention is being given to environmental protection in the south west United States by the Department of the Interior and other agencies. The Secretary of the Interior announced on May 7, 1971, the initiation of a comprehensive examination of the development of electrical power in the southwest United States, which will include an assessment of environmental impacts.

The meteorological consultants for the Four Corners, San Juan, Mohave, Navajo, and Huntington Canyon Generating Stations have recently completed a report assessing the cumulative impact of these generating stations on air quality in the Colorado River Basin[10]. The conclusions and recommendations of this report follow:

Conclusions and Recommendations

This study was a joint effort by several separate consulting organizations to assemble a unified report concerning the total impact on the environment of the southwest United States by the large coal-fired powerplants in this region. The report restricted its attention to only those plants which were (1) already in operation, (2) under construction, or (3) to those plants for which definite plans have been made. (Note: The generating stations considered in this study are listed hereafter.)

The major effort was an attempt to describe the meteorology and possible air movement or exchange during periods of restricted (or limited) dispersion conditions. These conditions have been referred to by several names, both within this report and in other reports related to this area - perhaps the most commonly used are "severe capping conditions" or "stagnation." No rigorous definition of this condition was presented; however, an attempt was made to describe the meteorological conditions necessary for stagnation.

Most cases of stagnation refer to a lack of a gradient dominated flow at the surface, with a resultant zero or small transport of air at the surface. Due to the strong influence of local winds (i.e., mountain-valley winds) in this region, the application of commonly accepted stagnation conditions, as applied to more level parts of the United States, does not produce realistic results. An effort was made to describe this mountainous region of the United States, considering both meteorology and terrain.

The specific question that this effort addressed was the possibility of an interaction between the various major powerplants in the area under limited dispersion conditions. The problem could be resolved by explaining the possible interaction of the various wind drainage patterns that dominate the local airflow in this region. Combining the meteorological and air quality data of several years of study by each consulting group into a coherent picture of the meteorology of the Colorado Drainage Basin, and coupling this with the terrain features, we feel that several statements can be made about the interaction of the powerplants in this area.

Out of this effort came the concept of "air sheds" described elsewhere in this report. Three important points need to be kept in mind about this study. The first is related to the

lack of good, long-term data in this area describing the local conditions. The second follows from the first in that only a general picture could be drawn for this area on the basis of the data available. The third is that the conclusions stated below relate to the so-called stagnation condition, which will potentially result in the worst air pollution episodes and is not necessarily valid for flow patterns dominated by gradient flow conditions.

The conclusions reached by this study group are:

a. Based on the combined arguments of local winds, terrain effects, and professional judgement, it is concluded that the area in question can be broken into several gross air sheds.

b. Evidence indicates little significant meteorological interaction between air sheds during stagnant conditions.

c. On the basis of an air shed concept, it is concluded that there is no significant interaction of powerplant effluents between these gross air sheds (the Four Corners and San Juan Powerplants are considered as a single source for the purpose of this report).

d. During the previously postulated 23-day stagnation period (January 4-27, 1968), the area was ventilated three times. Studies have indicated no large area air pollution buildup under extended periods of stagnation due to the environment's pollutant removal processes.

e. Meteorological studies indicate that stagnation may be as long as 13 days in this area; however, each separate air shed should be evaluated further since the degree of stagnation and its consequences will vary between the different locales.

The Joint Meteorological Report is presently being reviewed by meteorologists from the Bureau of Reclamation, Tennessee Valley Authority, Environmental Protection Agency, and National Oceanic and Atmospheric Administration. Comments are being sought from a broad base of Federal, State, and non-Governmental interests. This meteorological report was also distributed with the consolidated draft Environmental Statement on the Navajo Project which received wide circulation and review. TVA's comments on this Report have been received, and are included in Appendix A-39.

The following map (Figure 6) shows the location of the Station with respect to the Wasatch Plateau. The draft report of the Meteorology Work Group, Southwest Energy Study[14] concluded that there are no significant additive effects or concentrations caused by one plant on those of another if the plants are separated by 100 km or more.

GENERATING STATIONS CONSIDERED IN JOINT METEOROLOGICAL STUDY

Plant	Unit No.	Size (MW)	Date of Oper.	Design % Eff. Part. Cont.*1	Particulate Tons/ Day	SO_2 Tons/ Day	NO_x Tons/ Day
Four Corners	1	175	1963	99.2			
Four Corners	2	175	1963	99.2			
Four Corners	3	225	1964	99.2	10*2	65*2	66*2
Four Corners	4	755	1969	99.2	10	85.5	87
Four Corners	5	755	1970	99.2	10	85.5	87
Mohave	1	755	1971	98.7	6.5	78	72
Mohave	2	755	1971	98.7	6.5	78	72
San Juan	1	330	1973	99.5	2.95	65.5	31.9
San Juan	2	330	1977	99.5	2.95	65.5	31.9
Navajo	1	750	1974	99.5	2.42	70	68
Navajo	2	750	1975	99.5	2.42	70	68
Navajo	3	750	1976	99.5	2.42	70	68
Huntington	1	430	1973	99.5	1.4	44.8	36.0
Huntington	2	430	1978	99.5	1.4	44.8	36.0

*1 Design efficiency as of January 1, 1977.
*2 Total 3 units.

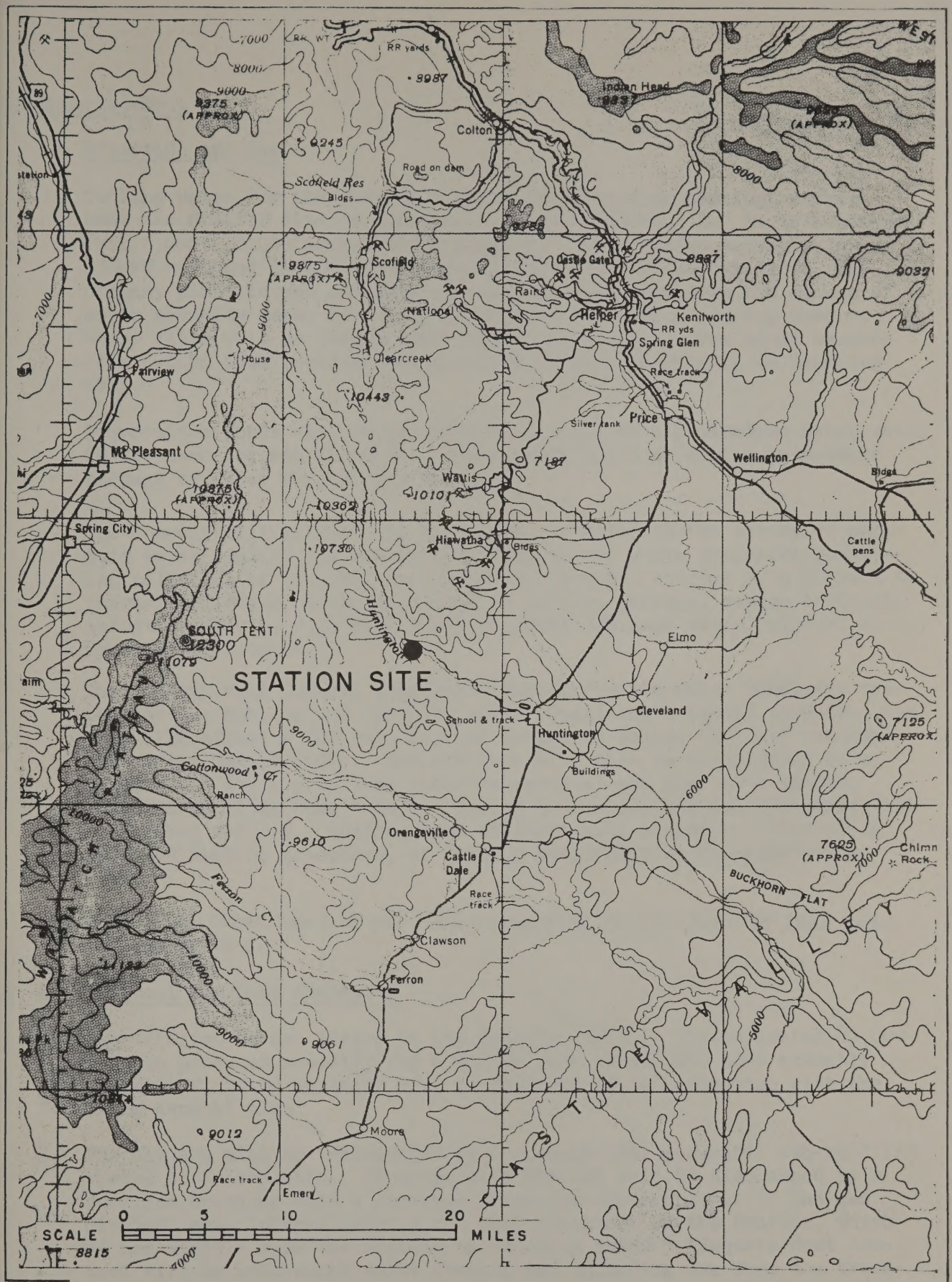


Figure 6. Regional map showing the Huntington Canyon Station site in relation to the Wasatch Plateau and Huntington, Utah.

1.2 Water Quality

1. Diversion and Use

Cooling water for the Station will be diverted from Huntington Creek near the Station site as shown on the map in Section 1. It is estimated that 6,000 - 8,000 acre-feet of water will be consumed annually for a 430-MW unit and 24,000 - 30,000 acre-feet at 2,000-MW capacity. The Company plans to use all feasible approaches to minimize the amount of water actually used, including recirculation through cooling towers, where water will be concentrated from 6 to 9 times. The minor amounts of blowdown thus required are expected to be used largely in handling ash.

Evaporation ponds will be provided to dispose of any blowdown water which is not used for ash disposal. These ponds would be sealed to prevent seepage of water through the ground.

The Company will prevent the return of any water to the stream to maintain water quality and comply with Federal and State standards governing pollution of streams, ground water, or water courses with respect to thermal pollution or the discharge of refuse, garbage, sewage effluent, industrial waste, oil, mine tailings, mine drainage water, mineral salts, or other pollutants.

The Company will install a packaged sanitary waste-water treatment system for the Station and the coal mine. Utilizing extended aeration, the unit will effect a 90% reduction of suspended solids (SS) and biochemical oxygen demand (BOD). The effluent will then be chlorinated to at least a one (1) p.p.m. free chlorine residual and sent to a holding pond for not less than 4 days. During this time, BOD and SS levels will be further reduced. Holding pond effluent will either be recycled in selected Station processes, or totally evaporated in an evaporation pond.

Huntington Creek has not yet been classified by the State of Utah under its regulations.

1.3 Ash Disposal and Dust Abatement

Ash characteristics are listed in the Appendix (A-5). The estimated 80,000 tons of ash produced annually for a 430-MW unit or 400,000 tons annually at the ultimate 2,000-MW capacity will be disposed of in accordance with the following general plan:

1. The fly ash will be transported by a conventional pneumatic ash-handling system to an ash silo. From the silo the ash will be discharged by a dustless unloader onto a conveyor or trucks for transport to the ash disposal area located about 4,000 feet southwest of the Station, which is not visible from the Station or existing roads. Adequate dust control will be maintained while loading and unloading ash from the transport vehicle.

2. Bottom ash, which will be about 25% of the total ash, will be carried hydraulically to a dewatering tank and transported to a disposal area.

3. The ash in the disposal area will be covered with earth taken from the area immediately adjacent to the ash disposal site, varying in consistency from fine clay and silt to sandy gravel, with some rock. The Company will establish a vegetation cover on the area to effectively stabilize the ash against transportation by wind or water to stream channels or other areas where it would be objectionable. The ash disposal area, approximately 4,000 feet south of the station, is satisfactory for disposal of in excess of 18 million cubic yards of ash, which would be suitable for the life of a 2,000-MW Station. The lower end of the ash disposal area will be diked to provide ponding for precipitation falling on the ash disposal area itself. Runoff coming from above the ash disposal area will be diverted around the ash area. Diversion will be designed for a probable maximum flood in a 50-year period. Soil tests have shown the disposal area to be relatively impermeable, and the Company expects no problem of water leaching from the ash into the ground water.

4. The general location of the ash disposal area is shown on Page 4. Topographic map and cross sections of the ash disposal site are in the Appendix (A-48). The cross section of dams will be similar to the cross section of the evaporation basin dam also attached (Appendix, A-49).

   The possibility of disposal of ash into exhausted mine shafts has been considered. However, because of the mine location and the length of the mine shafts, this is not feasible at present but will be studied further as technological developments occur.

   The Company proposes to install dams and upstream diversion as outlined so that precipitation of the ash disposal area will not be discharged into the stream and so that runoff coming from above the ash disposal area will be diverted.

   The collecting reservoir area upstream from the dam will be suitably sealed. Brigham Young University is monitoring the water resources of the area and should there be any indication that leaching from the ash could constitute a problem, steps would be taken to seal the entire ash disposal area.

5. Dust abatement will be achieved through:

   (a) Providing landscaping or ground cover for open areas immediately around the Station.

   (b) Paving all roads in the general Station area and switchyard areas.

   (c) Surfacing the switchyard area with crushed rock or other material to keep dust down.

(d) Delivering coal from the mine to the storage area by a covered conveyor, and covering the reclaim conveyor. The coal pulverizer will be enclosed to prevent escape of dust, and the Station will be pressurized to prevent infiltration of any dust into that area. Boilers will be of the balanced draft design.

(e) During construction, dust control will be effected through watering and other palliative measures.

3.1.4 Noise Levels

The Station is being designed to meet the noise level requirements of the Walsh-Healey Act, utilizing noise attenuation devices in accordance with the best available technology. Station conveyors will be enclosed. Specifications for fans, transformers, and other major equipment will require noise attenuation. Shielding and control of noise during steam releases will be provided by mufflers, or equivalent devices.

A study of noise levels beyond the Station boundary will also be conducted. Noise frequency, intensity, and time distribution will be measured. In general, the operation of a generating station does not produce high noise levels far beyond the Station area. Adverse ambient noise impacts are not expected for this installation in that no noticeable effects have resulted from other similar Company installations.

3.1.5 Aesthetics

The Station and appurtenances, and the transmission line will intrude upon natural settings; however, the switchyard and transmission line will be located to shield them from public view to the greatest extent feasible. The conveyor from the mine and the Station coal storage pile will be located in Deer Creek Canyon, largely hidden from general public view from Huntington Canyon. The conveyor from the storage pile to the Station is also located for minimum exposure by locating it at the rear of the Station.

Attractive landscaping of the Station area will add aesthetic appeal.

The architectural rendering of the Station included in this Statement gives an idea of how it will look in its natural setting. Architectural features and color schemes will be used to blend it as nearly as possible with the surrounding landscape.

3.1.6 Archaeology and Historical Values

An archaeological survey of the Station site and reservoir area was conducted by the Brigham Young University. No artifacts were found at the Station site and no salvage work was found necessary. Artifacts found in the reservoir site were salvaged by Brigham Young University. (Refer to the Coal Mine, Forest Highway Relocation and Transmission Line Sections of this chapter regarding archaeological findings of these areas.)

The Utah Division of State History has suggested that the coke ovens of the abandoned coal town of Connelsville be relocated and marked; that boat docki and camping facilities be located nearby, and an archaeological dig be conducted.

3.1.7 Radionuclide Release and Trace Elements

An analysis of fly ash from the coal from the Blind Canyon seam made by TRAPELO/WEST, Richmond, California, gave the following results:

TABLE 5

Peabody Coal - Fly Ash Sample					
		Concentration p Ci/gram dry fly ash			
TLW Code	Customer designation	^{226}Ra	^{228}Ra*	^{228}Th	^{232}Th
305 - 16	Blind Canyon seam, Deer Creek Mine	1.5	1.7	1.7	1.6

*Note: ^{228}Ra assume to be in equilibrium with ^{228}Th.

The maximum permissible concentrations in air have been established by the U.S. Public Health Service for radium and thorium as 2.0 and 1.0 pico curies per cubic meter, respectively. Emissions in the stack gases due to fly ash not collected by the precipitator will contain radioactive nuclides .001 of those allowable by Public Health Service standards for air. It is estimated that these levels will be further reduced some 6,000 times as the stack gases disperse to maximum ambient levels. It is probable, therefore, that there is no potential hazard in radionuclide emissions from the Station.

Included in the Appendix (A-31) are results from Ledgemont, Illinois, Geological Survey and Bituminous Coal Research, covering determination of mercury, chromium, and fluorine in coal from the Blind Canyon of the Deer Creek Coal Mine. Additional analyses of mercury and other trace elements that might be released during burning of the coal are being performed by the Bureau of Mines and by Brigham Young University scientists.

On the basis of present sampling, approximately 0.4 lb. to 0.8 lb. per day of mercury would be emitted from a 430-MW Station at full load, and 1.9 lbs. to 3.7 lbs. per day for 2,000-MW capacity at full load. It would appear from TVA calculations of stack dispersions that the maximum hourly mercury concentration would be in the order of .0074 to .0149 micrograms per cubic meter, assuming all mercury in the coal is vaporized. A threshold limit value of 50 micrograms per cubic meter has been set by the American Conference of Government and Industrial Hygienists for industrial exposure over an 8-hour day, 40-hour week. On this basis, mercury in the air should be no problem. It has been theorized that mercury may find its way into streams through precipitation. This is being closely monitored by Brigham Young University and more analytical work performed. With the small concentrations, however, it is highly unlikely that mercury could be a problem.

Water samples analyzed by Brigham Young University have not indicated the presence of mercury in the water passing the Station; however, mercury does appear in the water downstream of the town of Huntington, and this is thought to be attributable to sewage effluents and field pesticide leaching. Mercury levels below the town of Huntington have been measured at 0.1 to 0.3 p.p.b. Analysis of stream and existing reservoir sediments and organism tissues will also be made for mercury content.

The EPA April 10, 1972, letter suggested an assessment of the effects of possible mercury emissions on man and the biota.

In addition to the studies by Brigham Young University, mentioned above, the Company is involved with other utilities in the Western United States to further define the disposition and effect, if any, of mercury and other trace elements in fossil fuel plants. The study is being conducted by Radion Corporation and is expected to be completed by about February 1973.

Dr. A. Clyde Hill, University of Utah, commented as follows on the possibility of mercury contamination:

> Item 5 states that the 430 megawatt unit will emit some 150 lbs. of mercury (Hg) per year while the 2,000-megawatt plant will emit 750 lbs. of Hg per year and that the statement should discuss the effects of this Hg on man and the biota.
>
> Since sulfur dioxide (SO_2) emissions from the Huntington Canyon Powerplant will be 200,000 times the Hg emissions, we can estimate the ambient Hg concentrations from the predicted SO_2 concentration. Even if we take the extremely high average annual SO_2 concentration predicted by NOAA of 40 $\mu g/m^3$ in the high elevations, the average Hg concentration would be 0.0002 $\mu g/m^3$. This can be compared to the Environmental Protection Agency (EPA) safe level of 1 $\mu g/m^3$.
>
> In the Environmental Protection Agency (EPA) publication Background Information - Proposed National Emission Standards for Hazardous Air Pollutants Asbestos, Beryllium, Mercury, the following statement is found on page 16:
>
> > Because chronic health effects occur with longterm exposure, emission standards should be designed to restrict air concentrations to a daily concentration averaged over 30 days of 1 $\mu g/m^3$ of Hg.

2.1.8 Fish and Wildlife

The Station site is located at the west fringe of public domain adjacent to the Wasatch Plateau and near the mouth of Huntington Canyon. It will utilize a gentle sloping bench area above the canyon bottom. A 36-acre tract of public domain in T. 17 S., R. 8 E., Sec. 6, will be utilized. The majority of the tract is on the bench and is covered by pinon-juniper vegetation. Adjacent land to be utilized in the site is a revegetation project where pinon-juniper has been removed and the land reseeded to shrubs and grasses to benefit wildlife. Lower Huntington Canyon receives heavy deer use during winter months. Some livestock grazing also takes place.

In the Station area, about 600 acres will be altered for the Station proper, the ash disposal area, and the evaporation pond. The pond will be located in habitat of poor value that may be benefited by the presence of water, even of low quality. For mule deer, the most critical aspect of the project is the loss of the land to be occupied by the Station and the ash disposal area. These tracts are winter range, the habitat element that is limiting for deer. In fact, these facilities will occupy land of the Utah State Division of Wildlife Resources that was bought specifically for big-game winter range. It was of special value because the Division managed the land primarily to support wildlife.

In exchange for the big-game lands to be occupied by the Station, similar areas will be acquired and deeded to the Utah State Division of Wildlife Resources. In addition, only those areas around the Station proper will be fenced, leaving the rest of the lands open for free use by the wildlife. In the unfenced part, about 150 acres will be given special range improvement treatment, as will another parcel of public land nearby.

Wildlife resources will be lost as a result of the development of this project. Measures outlined above, acceptable to the Utah State Division of Wildlife Resources, have been taken to mitigate the loss of big-game winter range in the Station area. These measures will be adequate to take care of the present deer herd; however, long-term effects will be negative. Purchase and improvement of other lands are not true replacement of habitat. There will be changes in management objectives and range improvements, but the total acreage of potential wintering area will nevertheless be reduced.

The total effect on fish resources will be to substantially increase productivity, especially if the existing reservoirs on the Left Fork Huntington Creek drainage can be improved, as well as the quality of habitat in Huntington Creek downstream from Electric Lake Dam. The regrettable aspect is the loss of streams in the reservoir site, and the depreciation of Huntington Creek downstream from the Station diversion. Although streams do not furnish as much fishing as lakes, ponds, and reservoirs, they offer special qualities of experience to appreciative fishermen. Water development nearly always detracts from and seldom adds to stream-fishing resources. Utah is increasingly jealous of its remaining streams and tries to prevent unreasonable loss from any type of development.

A statement by the Company outlining its assessment of the effects of water use and control on the fishing and recreational interests in the area is included in the Appendix (A-28). The Bureau of Sport Fisheries and Wildlife, the Forest Service, and Utah Division of Wildlife Resources are making an independent study of the proposed water use with the objective of developing operational modifications for optimum fishery values based on findings of biologists.

3.1.9 Coal Mine and Coal Conveyance

Deer Creek Canyon, in which the coal mine is located, is characterized by steep canyon walls. There is a small, perennial stream which runs the entire length of the canyon.

This area presently receives very light recreational use, and that generally during the fall hunting season. Coal conveyance and storage, along with the Station development, will encroach quite heavily upon available game range.

The Station will burn mine-run coal (crushed to an appropriate size) and no spoil banks and waste from the underground mine are anticipated. This is in contrast to mines producing washed or sized coal for domestic consumption where bony and fines are sometimes wasted at or near the mine portal.

Very little, if any, grazing use is made in the area of the coal-mining activity. There is a small possibility that the projected coal mining could intercept springs on which grazing animals on adjacent areas are dependent.

There are no fisheries in the canyon. Contaminants from coal mining and water drainage from the mine will be diverted to a settling basin in Deer Creek Canyon, where coal dust contaminants will be settled out. Water from the settling basin will flow into the small Deer Creek stream which, in turn, will be diverted to the Station settling basin. Therefore, any contaminants from mining operations would eventually be disposed of in evaporation ponds and not be returned to Huntington Creek.

Additional details of the evaporation and settling basins are attached (Appendix, A-50 and A-51). Engineering is still in progress on the evaporation basin and some modifications are to be expected. It is anticipated that the evaporation basin will be sealed with an impervious blanket of clayey and very silty soils.

The immediate area is not rich in archaeological history. Brigham Young University found no locations that were worthy of salvage or protection in its review.

4.10 Forest Highway Relocation

Relocation of Forest Highway Route 7 will necessitate crossing several timber types varying from dense aspen stands to scattered stands of Douglas fir, alpine fir, and spruce. The timber presently is more important aesthetically than economically. Some construction scars will result, but the impact will be reduced as much as possible by judicious routing, rounding, and flattening cut slopes where feasible, and seeding and landscaping. Cutting into side slopes will be minimized, and slump and water seepage areas will be avoided wherever possible. The road design includes plans for replacing topsoil on cut and fill slopes, mulching, seeding, and landscaping. Construction contracts will include provisions for temporary and permanent erosion control and for air and water quality control.

The relocated highway will replace the present narrow, winding, dirt-surfaced road with an all-weather road that will greatly improve the access to the recreational and scenic areas of the region.

The highway right-of-way will not be fenced, and will not influence movement of livestock and wildlife beyond that caused by the highway proper and the traffic it will carry.

Initial investigation has been made by the Forest Service for possible archaeological and historical sites along the proposed route. No signigicant archaeological evidences were found.

3.1.11 Dam and Reservoir

The proposed 30,000 acre-foot storage reservoir (Electric Lake) will provide highly desirable water-oriented recreation in addition to serving the direct water needs of the Station. A General Plan and Section of the spillway and outlet works of the dam is included in the Appendix (A-34).

More than 26 miles of Huntington Creek, a good trout stream, will be affected by the project. In the reservoir site, about 3.5 miles of the creek (and another mile of minor tributaries) will be inundated. These waters will be replaced with Electric Lake, a 460-acre reservoir with fair potential for trout management. Although an attractive body of water when filled, its deep, steep-sided shape will not encourage a high biological response. Its greatest value will be its potential for control of downstream flows, and for operation in concert with other reservoirs in the drainage, as discussed later.

Between Electric Lake Dam and the diversion to the Station, there are about 19 miles of good trout stream--nearly all of which are in the Manti-La Sal National Forest. This reach has considerable potential for improvement through operation of Electric Lake.

Downstream from the Station diversion, Huntington Creek flows 4 miles to the Huntington-Cleveland Canal diversion. It is a moderately good fishing stream to that point. Further downstream, the Creek is frequently dewatered by irrigation diversion and, at best, is very marginal fish habitat. The 4-mile reach will be affected adversely by the diversions to the Station. Flows will be greatly reduced during the winter season and sometimes may be cut off entirely.

Consumption of water at the Station, approximately 7,000 acre-feet initially and 24,000-30,000 acre-feet with full use of water now planned for acquisition or development, will result in changes in the irrigated areas downstream. Part of this use is a conversion from the irrigation water supply, as explained under Section 1.1 hereof. A portion of the irrigation water is not consumed but reappears as return flows. Such return flows are of special interest because they are a substantial part of the water supply to the Desert Lake Waterfowl Management Area of the Utah Division of Wildlife Resources, a feature of the Emery County Project. It is not believed that the Station will significantly affect the Desert Lake area. Measurement of such effects will be difficult because the waterfowl area receives flows from only one segment of the downstream irrigated area served by Huntington Creek flows and the Emery County Project; however, it is possible that a small percentage of the acre-feet consumed at the Station will represent depletion in the water supply to the Desert Lake Waterfowl Management Area, especially in years when irrigation water supply is deficient.

Water for use at the Station has been purchased from the irrigation users and none of the water rights heretofore available for the Desert Lake Waterfowl Management Area have been purchased by the Company. There are almost 4,000 shares of Huntington-Cleveland Irrigation Company stock now in use at the Waterfowl Management Area and this is the same as existed before.

The Electric Lake Dam will be equipped with multiple-level outlets so that optimum water temperatures may be maintained downstream, and for quality control to prevent undesirable accumulations of marsh gases in the reservoir waters. It is also planned that continuing coordinated operations will be carried out with the cooperation of irrigation interests, the Forest Service, and the Utah State Division of Wildlife Resources to the end that the best possible fishing stream between Electric Lake Dam and the Station diversion may be maintained in Huntington Creek. The acquisition of part of the storage rights in Huntington, Cleveland, Rolfson, and Miller Flat Reservoirs of the Huntington-Cleveland Irrigation Company by the Company will further extend potentials for benefits from coordinated operations. The four reservoirs, all located on the Left Fork Huntington Creek drainage in the national forest, can also be improved as mountain trout fisheries. The maximum size of the reservoirs exceeds 400 acres, but they are in need of larger minimum pools.

The Electric Lake area will be maintained for public recreation, and its fishing will thus be assured to all who wish to use it.

With development of the Station and facilities, the lake will pose problems in relation to movement of livestock. There will be eight grazing allotments directly affected and numerous others affected to a lesser degree. Established trails and roads leading to these allotments will be inundated. In some instances, it will be difficult to find new routes without crossing additional allotments and increasing trailing distances, but some alternate routes are available.

A considerable part of the private range will be inundated. This land has a high-carrying capacity. When this land is inundated, the overall allotment capacity will be reduced considerably in some cases. With this reduction of available private land and pending adjustments on the Federal range, some allotments may become economically marginal. Very little timber will be disturbed.

One historic site of some significance, the abandoned town of Connelsville and related early-day coke ovens, is found in the area to be affected by the reservoir. Salvage of the important portions of this historic site will be effected.

The following plant associations occur within the general Upper Huntington Canyon area: aspen-snowberry, sagebrush-grass, and wet meadow-willow.

The aspen-snowberry association occurs in the better soil and is very productive containing many species of the desirable forage plants. These plants provide forage for both wildlife and domestic livestock. The aspen trees also provide nesting sites for many birds and also provide protective covering for many species of mammals.

The sagebrush-grass association occurs on the somewhat poorer soils and is less productive; however, it contains a large variety of plant species. Both wildlife and domestic livestock use these sites extensively. The sagebrush plants provide nesting sites for a few birds. They also provide protective covering for some ground-nesting birds and several species of mammals.

The wet meadow-willow association occurs in the canyon bottoms and along the streams. Because of the wet condition of the sites, forage production is high, but plants are less desirable for forage by domestic livestock. This plant association provides good nesting habitat for many birds and also a good protective cover for several species of small mammals.

Electric Lake will block existing access into Upper Huntington Canyon and James Canyon. Access into these two canyons is needed for administrative purposes, for forest users, for a privately sponsored youth camp, and to a cutoff route to Scofield Reservoir and U.S. Highway 50-6. Alternate routes will be provided.

During periods of drawdown of the reservoir, mud flats will be exposed at the upper end of the reservoir; however, these periods should be very infrequent. The graph in the Appendix (A-30) shows the projected operation of the reservoir.

3.1.12 Recreation

The general area of the project currently constitutes one of the more heavily used recreation areas on the Manti Division of the Manti-La Sal National Forest.[4/] The present road is narrow, winding, and dirt-surfaced, and closely parallels the stream course through the canyon.

Flat Canyon Campground receives heavy use and, in addition, recreation visitors use many undeveloped sites in this area. There are several inventoried national forest recreation sites. Provision should be made to provide access to these inventoried N.F.R. sites. The main recreation activities engaged in by the visitors to the area are stream fishing, lake fishing, camping, picnicking, and aesthetic viewing. Big-game hunters make heavy use of the area during hunting seasons.

The development of Electric Lake will provide for additional recreation opportunities related to water sports.

With development of the Station, there will be increased use on the area. The improved all-weather road will eliminate dust and mud, and improve access so more people can avail themselves of recreational opportunities and scenic vistas. The relocated road will pass in close proximity to Cleveland and Huntington Reservoirs and shorten the distance to Rolfson and Millers Flat Reservoirs. Cleveland and Millers Flat are good to excellent fisheries. It is anticipated that through coordinated operations with Electric Lake, sufficient water can be retained to provide fish conservation pools in Huntington and Rolfson Reservoirs--both of which, under present operation, are subject to complete drainage.

Camping, picnicking, boating, and fishing will increase after the Station and related features are completed. This increased use will place an additional impact on the already inadequate recreational facilities, and could contribute to overuse and overcrowding of campground and picnic areas. Additional recreational facilities will be constructed as a part of the development so that any adverse impact will be reduced, and greater recreational opportunities available.

1.13 Transmission Line

Both the Company and Government agencies gave careful attention to the location of the 365-mile Camp Williams-Four Corners 345-KV line so that the line would have the least adverse environmental impact possible.

The initial location involved numerous "on the ground" inspections with the Forest Service, Bureau of Land Management, and Indian tribe personnel--particularly in critical areas where public use was a factor.

In the Manti-La Sal National Forest, a team of forest experts worked nearly a year routing and rerouting, and designated special restricted areas to locate the line to have the minimum environmental impact.

The Bureau of Land Management conducted extensive field investigations along the transmission line route prior to its location, including archaeological investigations on public domain. Significant archaeological values on Alkali Ridge in San Juan County were protected through relocation of a 10-mile length of line. Public values were protected near Green River, Utah, where a 9-mile section was relocated to avoid conflict with proposed airport expansion. The Museum of Northern Arizona made an archaeological inspection of the route on the Navajo Indian and Colorado-Ute Indian Reservations.

The Colorado-Ute Indians also asked that the powerline be moved 5 miles farther west in southwestern Colorado to avoid crossing grazing lands.

Brigham Young University conducted a survey of the transmission line route to assure that no rare plant species were disturbed.

Information meetings with the press and other interested parties were held to keep them informed of the efforts being made to insure environmental protection and to obtain comments on the proposals.

The Bureau of Land Management, in its grant of right-of-way over lands under its jurisdiction, has included the following provisions relating to environmental protection and control:

1. Road access.--Construction of access roads will be held to a minimum. Disturbance of land surface will be restricted to minimize environmental impact.

2. Clearing.--Clearing of vegetation from right-of-way and from access roads will be limited to that necessary to satisfy safety requirements (construction and operational). Scalping of topsoil and removal of low-growing vegetative cover will not be allowed except around structures.

3. Historic and archaeological values.--Historic or prehistoric ruins and artifacts are to be identified and salvaged where appropriate.

4. Restoration and cleanup.--All public land areas, where soils and surface materials are disturbed through construction or otherwise incident to the project operations, will be restored to their natural state insofar as practicable to the satisfaction of BLM. Disturbed soil areas which, in the opinion of BLM, are susceptible to successful reseeding will be reseeded by the Company at its expense.

5. Sterilants and herbicides.--No soil sterilants or herbicides for control of vegetative cover within the right-of-way or associated access road areas will be used without prior approval of BLM.

The Company made every effort to minimize adverse visual impacts of the transmission towers. Specially designed towers were used in several cases to blend the towers into the landscape in the most pleasing manner possible. Extensive use was made of helicopters to transport materials in lieu of building access roads in the forest restricted area.

The EPA April 10, 1972, letter suggested that ozone generation from the transmission line be discussed. The Company commented as follows regarding ozone as a possible hazard:

> Ozone produced at 3 lbs. per mile per day constitutes an insignificant addition to the natural background of ozone, particularly as the line is generally remote from sources of hydrocarbon emissions which combine to form smog. Tests taken over the energized line have been unable to measure ozone production at the line as contrasted to areas remote from the line.
>
> Nevertheless, using 3 lbs. per day ozone generation per mile of high voltage line, one can compute in a 3 mph crosswind the ozone concentration may reach 1.5×10^{-5} p.p.m. or 1.5×10^{-3} p.p.h.m. at a peak some 500 feet from the line. In a downwind a value perhaps 100-fold higher, or a value of 1.5×10^{-1} p.p.h.m. The global average ozone concentration is of the order of 3 p.p.h.m. Thus, this level of generation cannot have any effect on health or plant life. Further, the half life of ozone in air at ambient temperatures is approximately 1 hour. Thus, any far-reaching effect of this ozone generation is not of concern.

The Company's conclusions appear to be reasonable based on Reclamation's extensive observations of its transmission system.

If, and when, units in addition to the 430-MW unit presently under construction, are to be constructed, additional transmission line capacity will be required. As stated under Section 1.3, such action would require assessment of environmental impacts and preparation of Environmental Statements.

1.14 Man-caused Accidents and Natural Catastrophes

Accidents could cause a malfunction of air and water quality facilities for short periods, but necessary compliance with Federal and State standards would cause corrective measures to be taken immediately, such as reducing Station operation, to eliminate any hazards to health or welfare.

The plans and specifications for the holdover reservoir storage dam are being submitted for review for structural safety by the State Engineer's Office, State of Utah.

An accident to the effluent settling pond could cause high concentrations of solids to be flushed into Huntington Creek. Periodic inspection and maintenance will be necessary to prevent such an occurrence. The same would apply to any retention dam that may be constructed in the ash disposal area.

1.15 Other Impacts

Onsite and downstream water quality may be impaired temporarily because of activities associated with the dam and road construction. Sediment will be contributed to the watercourses in increased amounts. This will result in degradation of the stream habitat. Rehabilitation of the stream habitat will be dependent upon the amount of sediment introduced into it. Debris removal could contribute to sediment in the stream.

The operation and maintenance of the reservoir will present visual impacts with mudflat areas being visible during periods of water drawdown which will be infrequent. The upper reaches of the reservoir will be relatively shallow water which will recede rapidly with any drawdown. These impacts can be mitigated by planting water-tolerant vegetation along the shoreline below high-water elevation.

Construction activity and noises may impair the recreational experience of the public in these areas. Travelers will experience some inconveniences and delays because of construction equipment and rough broken road surfaces during work periods.

The National Register of Historic Places has been checked and no National Register properties will be affected by the project.

The environmental consequences of changing the water use from agriculture to use in the Station as described under Section 1 will be as follows:

a. Some lands now producing forage and small grains may be taken out of production at specific times. Presumably economics will influence the decision of individual landowners as to which lands are retired, and those

lands of poorest quality and which are least productive will likely be retired first.

b. Lands deprived of a full supply may be usable with a partial water supply for pasture for farm animals.

3.2 Environmental Impact Effects

This subsection considers some aspects of the principal environmental impacts discussed previously. Some data on environmental impact effects are given to form a frame of reference within which the effects of the impacts predicted for this Station might be evaluated. In evaluating possible effects, it should again be observed that the Company will be required to comply with all applicable Federal and State laws and regulations relating to air and water pollution in the construction and operation of the Station, and to meet with representatives of the United States periodically, but at least every 10 years, to review technological advances in air pollution control equipment when decisions will be made about the feasibility of installing additional equipment or modifying existing equipment to achieve better control. The Company will also be required to submit plans to the Secretary of the Interior for his review and comment regarding noise abatement, dust abatement, and ash disposal, and these plans will be subject to review at least once every 5 years to take advantage of new technology as it develops.

There is every indication that the Company will meet applicable air quality standards in its operation of the Station and appurtenant facilities. Federal and State air and water quality standards are conservatively established, or will be established, as studies and research progress, at levels that minimize adverse effects and protect health and welfare consistent with technological capability. In this connection, an excerpt from the EPA national primary and secondary ambient air quality standards, published in the Federal Register, April 20, 1971, is quoted:

> Current scientific knowledge of the health and welfare hazards of these air pollutants is imperfect. To increase and improve this knowledge, the Environmental Protection Agency will continue to conduct and support relevant research. At the same time, the need for increased knowledge of the health and welfare effects of air pollution cannot justify failure to take action based on knowledge presently available. The Clean Air Act, as amended, requires promulgation at this time of national standards for six air pollutants on the basis of available data set forth in air quality criteria documents; thus the Administrator is required to make judgments as to the proper interpretation of presently available data and to establish national primary standards which include an adequate margin of safety to protect human health. Where the validity of available research data have been questioned, but not wholly refuted, the Administrator has in each case promulgated a national primary standard which includes a margin of safety adequate to protect the public health from adverse effects suggested by the available data.

Further safeguards of environmental values will be ensured by the action of the Department of the Interior, through the Bureau of Reclamation, in carrying out its responsibilities under the water supply contract heretofore mentioned, and by other Federal agencies in issuing leases and permits, and enforcing their provisions.

The effects of the environmental impacts resulting from the Forest Highway relocation, the dam and reservoir, and coal mining, as discussed in this section, have been arrived at by studies and assessment of such impacts by the Forest Service, Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, Federal Highway Administration, and Bureau of Reclamation.

The comments and references that follow are intended to be illustrative of research and opinions on the effects of some general types of environmental impacts. The air pollution levels mentioned in the following referenced sources as having adverse effects are, in most instances, well above the levels predicted for the Station in the modeling work that has been performed. They should be considered in context of the environmental impact section of this Statement.

The studies and research that have been conducted in this field to date lead to the general conclusion that the best possible control of environmental impacts in the construction and operation of the Station is extremely important, but with proper controls environmental impacts will not be serious.

1. Human Health

(a) Emissions

"The First Annual Report of the Council on Environmental Quality,"[5] in discussing air pollution effects, states:

> Knowledge of the health effects of specific contaminants present in the air is far from complete. However, the more overt health effects of several major classes of pollutants are beginning to be defined. Those pollutants are found almost everywhere in the United States.

In considering effects on human health of some of these pollutants, the DHEW report, "Air Quality Criteria for Sulfur Oxides,"[6] states:

> At concentrations of about 115 $\mu g/m^3$ (0.040 p.p.m.) of sulfur dioxide (annual mean), accompanied by smoke concentrations of 160 $\mu g/m^3$, increase in mortality from bronchitis and from lung cancer may occur.

The CEQ report referred to above[5] also states:

> Less is known about the effects on health of nitrogen oxides, which play such an important part in producing photochemical pollution. They have been little studied until recently. However, evidence so far suggests that

> they may be harmful to human health. A study in Chattanooga, Tennessee, linked very low levels of these oxides in the air to children's susceptibility to Asian flu.
>
> The lowest particulate levels at which health effects have been noted in the United States were reported at Buffalo. The Buffalo study suggests that the overall death rate rises in areas with an annual average concentration ranging from 80 to 100 micrograms per cubic meter. The study also reveals a tie between these levels of particulate matter and gastric cancer in men 50 to 69 years old. A similar association was found in a Nashville study. Particulate levels in this range are found in most major urban areas and are common even in smaller industrial cities.

Stearns-Roger Corporation's Manager of Environmental Sciences Division, in a letter dated August 11, 1961, to the Company, commented on the foregoing quotation as follows:

> Particulate levels in a city are more of a health hazard because they contain more harmful pollutants; for example, most particulates measured in cities contain asbestos brake lining, tire rubber, and lead--none of which should be at significant levels in the rural area of this powerplant.

DHEW, in its report, "Air Quality Criteria for Sulfur Oxides,"6/ concludes:

> Under the conditions prevailing in areas where the studies were conducted, adverse health effects were noted when 24-hour average levels of sulfur dioxide exceeded 300 $\mu g/m^3$ (0.11 p.p.m.) for 3 to 4 days. Adverse health effects were also noted when the annual mean level of sulfur dioxide exceeded 115 $\mu g/m^3$ (0.04 p.p.m.).

In contrast, M. D. Battigellie, M.D., in an article in the "Journal of Occupational Medicine," September 1968, "Sulfur Dioxide and Acute Effects of Air Pollution,"7/ states:

> In summary, the search for an acceptable rationale, or for reasonable evidence documenting a toxico-logical relevance of SO_2 levels as these are encountered in urban air pollution, has thus far failed. If urban pollution has a measurable effect on the health and disease of exposed populations, as it appears to have, on the basis of available information, this phenomenon does not appear to involve sulfur dioxide in its mechanism.

In the same hearing, Mr. Nelson quoted from a statement on May 18, 1967, by Dr. E. J. Cassell, Mt. Sinai School of Medicine, New York City, to the Muskie Subcommittee on Air and Water Pollution:

> There is no proof that SO_2 alone, or at levels anywhere near those found in urban atomspheres, has any adverse effects on man.

DHEW, in its publication, "Air Quality Criteria for Particulate Matter,"[8] concluded:

> Under the conditions prevailing in areas where the studies were conducted, adverse health effects were noted when the annual geometric mean level of particulate matter exceeded 80 $\mu g/m^3$.

(b) Dust

Airborne dust will add to the air pollutant problem in minor respects during construction, but the contractors will be required to take measures to keep this to a minimum. The Company will also take measures to prevent blowing of ash from the ash disposal area, including establishment of a vegetation cover.

(c) Noise

Noise levels in the Station will not exceed Federal occupational standards, and measures are being taken to minimize noise, as discussed in this Statement. The isolated location of the Station will prevent noise impact on heavily populated areas.

(d) Radionuclides

Studies to date indicate that radionuclide releases will not pose a health hazard. Refer to the section of this Statement on Radionuclide Release and Trace Elements for data on this subject.

(e) Leaching From Ash Disposal Area

Some questions have been posed about the possibility of leaching from the ash disposal area into the ground water, and the consequent hazard if such leaching occurred. Soil tests indicate very low percolation rates in the general area. The Company will take whatever action is necessary to prevent adverse effects from this source.

2. Vegetative Effects

The Station site and storage reservoir (Electric Lake) face the boundaries of the Manti-La Sal National Forest on the west, southwest, and northwest, where the principal vegetation consists of fir, pine, quaking aspen, oak brush, with scattered sagebrush flats. The area to the east, south, and

northeast of the Station site changes from typical juniper, pinon growth to desert-type vegetation, such as sagebrush, rabbit brush, etc., as the distance from the site increases.

"The First Annual Report of the Council on Environmental Quality"[5] states:

> At sulfur oxide levels routinely observed in some of our cities, many plants suffer a chronic injury described as "early aging." Nitrogen dioxide produces similar injury symptoms, and seems to restrict the growth of plants even when symptoms of injury are not visible. Ozone, a major photochemical oxidant, is a significant threat to leafy vegetables, field and forage crops, shrubs, and fruit and forest trees--particularly conifers. The damage from ozone in minute quantities can be great. Extended ozone exposure to 0.05 parts per million can reduce a radish yield 50%.

The DHEW publication, "Air Quality Criteria for Sulfur Oxides,"[6] reports with respect to sulfur dioxides:

> Adverse effects on vegetation were observed at an annual mean of 85 $\mu g/m^3$ (0.03 p.p.m.).

The University of Utah study referred to herein includes fumigation trials of the effect of SO_2 on vegetation indigenous to the Station area.

Quoting from the hearings of the Utah Air Conservation Committee,[7] Harris M. Benedict, an employee of Stanford Research Institute, testified:

> There have been many studies conducted on the effects of sulfur dioxide on plants. Some of these are field observations, and some are carefully controlled laboratory fumigation studies. These studies have generally suggested that leaves of sensitive plants, such as alfalfa and white pine, may develop markings after 8 hours' exposure to .24 to .30 p.p.m. Probably the most inclusive and most thorough of such studies involving field and laboratory results are the investigations of Thomas, O'Gara, Hill, and coworkers conducted right here in Utah. As a result of these studies, some 100 species of plants were ranked according to their sensitivity to sulfur dioxide. The most sensitive plant found, alfalfa, was then used in highly refined studies to determine the time of exposure required at various concentrations to mark the leaves and to reduce or interfere with photosynthesis.
>
> The results showed that unless the leaves were marked, no permanent effects on the growth of the plant occurred. Although during the exposure itself, the rate of photosynthesis might be reduced; however, the photosynthetic

rate quickly returned to normal when the exposure to sulfur dioxide was stopped, unless some of the leaf tissue was killed.

The results of these numerous experiments have received worldwide acceptance and have generally been corroborated by Dr. Morris Katz (Ind. & Eng. Chem. 41:2450-2465).

More work is needed to substantiate synergistic responses, especially in the higher altitude, low humidity climates of the Western States, since it is known that climatic conditions markedly affect the response of vegetation to air pollutants.

Natural vegetation along the proposed roads and coal transportation system will be replaced at least temporarily by introduced grasses and shrubs. Complete reestablishment of natural vegetation will be a long-term process. The reservoir and road relocation will cover up considerable forage that is presently used by domestic and game animals. This loss will not be retrievable. The use of salt and/or coal dust during the winter months on the proposed road relocation may be detrimental to roadside vegetation and stream quality.

The EPA April 10, 1972, letter (copy in Section 9) raised a question regarding possibility of damage to vegetation from Station emissions. Included in the Appendix (A-46) are comments by Dr. A. Clyde Hill, University of Utah, who has performed extensive study on this subject. His conclusion is that, "The available data indicate that injury will not occur." The preponderance of evidence appears to support this conclusion.

3. Visibility

"The First Annual Report of the Council on Environmental Quality"5/ comments on visibility effects of air pollution to this effect:

> Particulates, however, are the major villain in reducing visibility. Particles (ash, carbon, dust, and liquid particles) discharged directly to the air scatter and absorb light, reducing the contrast between objects and their backgrounds. Particles are also formed in the atmosphere by photochemical reactions and by the conversion of sulfur dioxide to sulfuric acid mist. Wherever sulfur pollution is significant, which is wherever large amounts of coal and oil are burned, visibility diminishes as relative humidity rises.

The DHEW publication, "Air Quality Criteria for Particulate Matter,"8/ states under the conditions set forth in the studies referenced therein:

With a typical rural concentration, such as 30 $\mu g/m^3$, the visibility is about 25 miles; for common urban concentrations, such as 100 $\mu g/m^3$ and 200 $\mu g/m^3$, the visibility would be 7.5 miles and 3.75 miles, respectively.

With respect to sulfur dioxide concentrations, the DHEW publication, "Air Quality Criteria for Sulfur Oxides,"6/ states:

> Visibility reduction to about 5 miles was observed at 285 $\mu g/m^3$ (0.10 p.p.m.).

This does not, however, appear to be a typical case. The following graph taken from the same publication illustrates the effect of relative humidity, which would be low at the site of the Station.

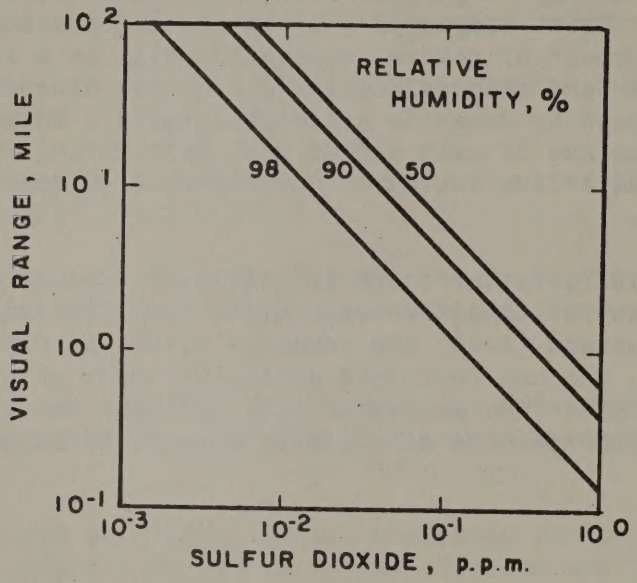


Fig. I-5 Calculated Visibility (Visual Range) in Miles at Various Sulfur Dioxide Concentrations and at Different Relative Humidities in New York City.

Stearns-Roger Corporation's Manager of Environmental Services Division, in a letter dated August 11, 1961, to the Company, commented as follows on the foregoing graph:

> Figure 1-5 is taken directly from page 14 of the Criteria Document for Sulfur Dioxide without recognizing the procedure used to arrive at the information. The procedure was this: A correlation was made based on data taken in New York City with an assumed ratio between the levels of SO_2 and particulates. Specifically, a ratio of 1,200 $\mu g/m^3$ particulates to one part per million SO_2 in the air was assumed. This ratio came from data actually taken in New York City and probably represented reasonably well data reported in 1964 and 1965 in that city. Measurements were then made of visibility over a wide range of SO_2 levels,

and these data were correlated. Finally, equations were developed on the basis of sulfuric acid mist concentrations and visibility range. A second correlation between sulfur dioxide and sulfuric acid mist concentrations with parameters of relative humidity was made. These were then put together mathematically, and the sulfur dioxide levels vs. visibility range diagram shown in the report developed. There is no evidence to indicate this calculated relationship will hold under other circumstances. Further, it is based on the high particulate to SO_2 ratio measured in New York in 1964 and 1965.

The emission of submicron size particulates is beginning to be recognized as a major factor in visibility reduction.

4. Other Effects

The proposed Forest Highway relocation route will provide improved access to a large area for recreational pursuits, hiking, camping, fishing, and water sports associated with the new Electric Lake. The road is planned to provide attractive scenic vistas of the new lake, and open other areas of beauty providing scenic views which are presently almost inaccessible.

The construction will make some new cut scars, but the design is planned to reduce the impact by rounding and flattening slopes where feasible and by replacing topsoil, seeding, and landscaping. Some of the steeper backslopes and cuts through rock will have what may be considered an adverse impact.

There are no parks, historic or cultural sites, which will be affected along the road relocation route. The new location will provide the potential for the creation of a number of camping and picnicking developments on attractive sites near the new road.

The road as proposed is considered to provide a pleasant, safe-driving experience and is planned to be a good neighbor. Extensive materials investigations along the route have not revealed any evidence of archaeological or paleontological resources; however, Federal Highway Administration procedures are such that should resources of either kind be encountered during construction, the necessary study and salvage operations can be instituted so that the resources can be preserved.

Established trails and roads leading to grazing allotments in the vicinity of Electric Lake will be inundated, as will a considerable part of the private range, resulting in some degradation of grazing.

4. MITIGATING MEASURES

4.1 General

The Company is committed to enhancement and protection of environmental values. Its efforts will be reinforced by cooperation with various Federal and State agencies with responsibilities and expertise in this field.

4.2 Company Environmental Policy

The Company's policy on preservation and enhancement of the environment was set out as follows in January 1971:

> Utah Power & Light Company recognizes that as an electric utility it has definite responsibilities in the preservation and enhancement of our environment--both in the control of pollutants entering our waters and atmosphere and in the appearance of our facilities. Our Company pledges its continued attention to these important social responsibilities. We will continue to make all economically feasible and prudent expenditures to achieve these objectives. We will continue to provide information to Government agencies, community leaders, and the press concerning any activities, present and planned, that may have an effect on our environment.
>
> Utah Power & Light Company recognizes that its future and that of its employees is inextricably tied to the future of the area it serves, and the Company is eager to continue its contribution to improving our environment.

4.3 Environmental Studies

Environmental studies, aimed at mitigating, protecting, and enhancing the environment, including essential monitoring, are under way in connection with this project as follows:

1. University of Utah is making a comprehensive study and evaluation of atmospheric, vegetation, animal, and general ecological conditions before construction of the Station. Appendix A-35 is an outline of the study as it is being conducted.

2. Brigham Young University Center for Environmental Studies is making a study to determine effects on the aquatic ecosystem caused by emissions and effluent from the Station and associated reservoir. An outline of the study purpose, objective, and approach is in the Appendix (A-37). The annual report for calendar year 1971 has been published by BYU as a part of this study.[3]

3. The Forest Service has made an environmental analysis of the Huntington Canyon Station, transmission line, Forest Highway relocation, Electric Dam and Reservoir, and Deer Creek coal mine and coal conveyance system on the Manti-La Sal National Forest.[4]

4. Cooperative studies involving Bureau of Sport Fisheries and Wildlife, Utah State Division of Wildlife Resources, Forest Service, and Utah Power & Light Company are under way to arrive at the best plan for protection and enhancement of fish and wildlife resources consistent with Station operations and maintenance requirements.

5. Brigham Young University conducted an archaeological survey of the Station site. Forest Service has completed an archaeological survey of the Forest Highway relocation. No significant archaeological evidence was found. BLM conducted archaeological surveys in connection with location of the transmission line in significant archaeological areas of southeast Utah.

6. BLM is involved in continuing vegetative trend studies on public land in the vicinity of the Station site. The program will be expanded to other plant species, including deciduous trees, conifers, additional browse, and grass species. Study plots will be established at various elevations south and east of the Station site.

7. A physiological study of deer and small mammals in the Huntington Canyon area is being carried out by the Utah Division of Wildlife Resources with funds provided by the Company. Initiation of this study in advance of operation of this Station will provide background data for comparison with sampling done for several years after the start of the Station.

8. An organization known as the Colorado Plateau Environmental Advisory Council was formed in September 1970 for the purpose of collecting and maintaining data concerning all environmental features of the Colorado Plateau, and to encourage and coordinate research efforts which should lead to an exhaustive understanding of the past, present, and future environment of the Plateau area. The Colorado Plateau is defined as the drainage area of the Colorado River upstream of the Mogollan Rim.

4.4 Aesthetics

The Company recognizes that aesthetics are an important part of its responsibility to protect and enhance the environment.

Attention to this element of the overall environmental picture is being given thorough efforts to locate principal features of the Station, road, and transmission line to minimize adverse visual impact, to shield objectionable features from public view wherever possible, to avoid unnecessary destruction of vegetation, and to cooperate with Federal and State agencies in the enhancement of aesthetic values.

The Company is also employing the most modern architectural and landscaping concepts to make the Station as attractive as possible, and to blend it with the surrounding physical features to avoid harsh and extreme visual impact. The transmission line routing was carefully selected, in cooperation with responsible Government agencies, to minimize adverse aesthetic impact.

5 Air Quality

5.1 Contractual Air Quality Requirements

The pending contract among the Emery Water Conservancy District, the United States, and the Company for the sale of water will require the Company to:

1. Install equipment designed to remove substantially all particulate material in the stack emission, and operate such equipment so that the amounts of particulates emitted shall not exceed 0.05 pounds per million B.t.u. heat input (ASME measuring procedure), resulting in particulate removal in the range of 98.9 to 99.2%. The Company plans to install particulate removal equipment with an efficiency of 99.5% removal guaranteed by the manufacturer.

2. Install and operate facilities or equipment to comply with applicable Federal, State, or local laws, regulations, or standards, for the control of oxides of sulfur and nitrogen, and the design of the Huntington Canyon Station will, to the extent practicable, provide for the future installation of any equipment or facilities required to comply with said Federal, State, or local laws, regulations, or standards.

3. From time to time but not less often than once every 10 years, representatives of the Company and the Department of the Interior shall meet to review technology in air quality control equipment and determine the feasibility of installing new or additional equipment, or modifying existing equipment for the purpose of improving performance--taking into account costs and economic feasibility as well as benefits of improved air quality.

5.2 Plans to Maintain Air Quality

The current plans of the Company to maintain air quality in the area subject to the emissions from the Station are:

1. To install stacks of a height to provide the most efficient dispersion of flue gases. The Company's consultants (Stearns-Roger Corporation) have recommended a 600-foot stack for the first unit.

2. To install precipitators having a design efficiency to meet or exceed Federal and State standards. The first unit will have a cold-side electrostatic precipitator guaranteed by the manufacturer to have a design efficiency of 99.5%.

3. To utilize a low-sulfur coal (average 0.50% sulfur).

4. To review the available processes for SO_2 removal; to perform a research and development program to speed up the availability of a feasible process; to provide space for later addition of an effective process on the first unit; and install SO_2 removal equipment on subsequent units to meet State and Federal standards or implementation plans.

5. To install boilers which utilize a tangential firing pattern, and to provide other features which may reduce NO_x, such as alternate furnace air inlet locations and overfire air ports to reduce flame temperature, or other technological improvements as they become available for this purpose.

4.5.2.1 Particulate Removal

Existing electrostatic precipitators are performing at efficiencies greater than 99% on low-sulfur coal on a sustained basis in Australia, Europe, and Africa. Model tests include the large-scale tests at the Company's Naughton No. 3 plant which incorporates an electrostatic precipitator of the same manufacturer as Huntington. Such tests are being conducted to assure that a liberal precipitator design has been planned for Huntington.

With regard to this subject, TVA commented in a letter of May 25, 1971, regarding this Station:

> TVA still maintains its skepticism about the ability of manufacturers to provide electrostatic precipitators which can consistently remove 99½% of the ash from coals, such as those to be burned at Huntington Canyon. We are aware of Central Electricity Generating Board's reported results of 99½% or better for several of their units; however, coals with higher ash and sulfur content were being burned by CEGB than will be burned at Huntington. Not all of CEGB's precipitators designed for this high efficiency are meeting their design level of performance. Reported results on the hot-side precipitator at the Ravenswood plant of Consolidated Edison are quite encouraging. As much as 99.6% of the ash has been removed from a gas flow of 4,300,000 cubic feet per minute. Since the hot-side precipitator is relatively insensitive to the sulfur and ash content of the coal, it may well have significant advantages over the cold-side precipitator for this installation.
>
> Nevertheless, the design of a precipitator is still more of an art than a science, and all involved should be prepared to accept the fact that a long sustained effort, including modifications, may be required before, if ever, 99.5% efficiency is reliably and consistently attained.

On the other hand DHEW, in its publication on control of particulates,[2] states in reference to electrostatic precipitators:

> Such devices are capable of collection efficiencies of at least 99.5%, and it is quite possible that even more efficient systems can be provided if necessary.

In any event, the Company is committed to meeting Federal and State standards on particulates.

5.2 Sulfur Dioxide Removal

SO_2 has been recognized as one of the more critical effluents of coal-burning generating stations. Studies are under way by the Company and its consultants to analyze SO_2 removal equipment that could be the most feasible for this Station. The Company is also cooperating in pilot generating station installations in an effort to obtain the best possible data on which to base a decision on SO_2 removal equipment.

In a letter dated August 5, 1971, the Company outlined its position on SO_2 control as follows:

> Extensive meteorological studies conducted by North American Weather Consultants, with consultation by Stearns-Roger Corporation and University of Utah, have indicated that under the most adverse meteorological conditions, effluents from the first unit of this plant would not result in ambient pollution levels above the existing State and Federal ambient air standards at the plant, up and down the canyon, and in adjacent towns. We have no reason to believe that present State and Federal ambient standards do not adequately protect health and welfare.
>
> Our plans, however, do set aside adequate space for possible future installation of SO_2 removal equipment. This equipment can be designed to permit installation while the unit is in operation with minimal down time in making duct connections; therefore, even though the first unit would be in operation, there would be no difficulty in adding SO_2 removal equipment.
>
> Our consulting meteorologists have advised that stack effluent from the ultimate Huntington Canyon plant will not have a significant effect in the Four Corners area.
>
> The Huntington Canyon plant will develop over an extended period of time, giving ample opportunity to monitor air quality, test the predictions, and take advantage of technological advances in pollution control equipment now under development.
>
> At any time available data indicated we would not be complying with air quality standards, we would move immediately to install commercially feasible SO_2 removal equipment on the first unit at Huntington Canyon.

In addition, the Company officials do not feel that SO_2 removal processes or equipment have yet been developed to a point where they would be justified in making a commitment on a specific removal system in time to permit installation in the first 430-MW unit at the time it goes on line in 1974. It is anticipated that stringent State and Federal emission standards will be in force and applicable to SO_2 control as subsequent units come on line.

The Company's position on SO_2 removal equipment, as expressed above, recognizes that more stringent SO_2 standards will be applicable in the future, and that the Company would be required to comply with them.

The Environmental Protection Agency in its April 10, 1972, letter commenting on the draft Environmental Statement (copy in Section 9) stated:

> Since SO_2 control systems are now commercially available and given the lead time for such equipment, steps should be taken to incorporate a suitable SO_2 control system into the original plant design rather than attempt to retrofit at a later date. The need for such an SO_2 control system has been identified as a result of a recent calculation based on an atmospheric model for the Southwest Energy Study done by the National Atmospheric and Oceanic Administration (NOAA). These calculations indicated that operation of unit #1, would, under varying conditions, lead to violation of the national SO_2 ambient air quality standard. This is particularly true for short-term concentrations under conditions of limited mixing.

The company, in its letter of April 17, 1972, to the Bureau of Reclamation pointed out that:

> The second unit, now tentatively planned for operation in 1977, would have to be committed before obtaining operating experience on the first unit. However, the second unit will have the benefit of monitoring of the first unit for at least 3 years insofar as identifying problem areas, if any, and a limited time for modification of equipment, if necessary. Extensive operating experience would be possible before commitment of a third or fourth unit.
>
> The Company's consulting meteorologists do not agree with the predicted concentration computed by NOAA for the Southwest Energy Study on high terrain and, as such, the Company feels that the need for such SO_2 control for the first unit has not been identified. The Company, of course, recognizes the problem of having to reconcile the divergence of opinion with respect to predictions of SO_2 concentrations on the high terrain adjacent to the plant. Studies by North American Weather Consultants utilizing the tracer fluorescent particle techniques during February 1972 show no concentrations out of line with those computed and appearing in the North American Weather Consultants' Report No. 706-A2/ to the Company. Also, additional balloon tracking appeared to confirm the consultants modeling assumptions. Further studies being performed by the University of Utah at the Company's Carbon Plant in Price Canyon to better define the meteorological conditions peculiar to such a canyon site, including inspection of vegetation, thus far confirm the consultants' predictions. As there appears to be no evidence which supports concentrations of the magnitude predicted by NOAA, the Company believes there is not sufficient justification for installation of SO_2 equipment for initial operation on the first unit.

In view of the Company's commitment to comply with Federal and State standards, and the conflict in expert opinions regarding SO_2 concentrations, the Company's position appears to be reasonable.

A review of literature and studies on desulfurization of coal indicates that no feasible process has been perfected, even on high-sulfur coal. No information is available on low-sulfur coal desulfurization research. DHEW, in its report, "Report on Control Techniques for Sulfur Oxide Air Pollutants," (January 1969)[1] states that:

> Because the degree to which a particular coal can be cleaned varies widely and depends on the amount and distribution of the pyrite sulfur in the coal, quantitative statements about coal cleanability, its cost, and the amount of cleanable coal available cannot be made.

It appears that development of a feasible desulfurization process is too far in the future for initial consideration on the Station.

4.6 Water Quality

4.6.1 Contractual Water Quality Requirements

The proposed contract referred to under 4.5.1 contains a provision requiring the Company to comply with all applicable Federal, State, and local laws, orders, and regulations pertaining to pollution of streams, reservoirs, ground water, or water courses with respect to thermal pollution or the discharge of refuse, garbage, sewage effluent, industrial waste, oil, mine tailings, mineral salts, or other pollutants.

4.6.2 Maintenance of Water Quality

The Company plans to use all feasible approaches to minimize the amount of water actually used, including recirculation through cooling towers, where water will be concentrated from 6 to 9 times. The minor amounts of blowdown thus required are expected to be used largely in handling ash.

Evaporation ponds will be provided to dispose of any blowdown water which is not used for ash disposal. These ponds would be sealed to prevent seepage of water through the ground.

The Company will prevent the return of any water to the stream to maintain water quality and comply with Federal and State standards governing pollution of streams, ground water, or water courses with respect to thermal pollution or the discharge of refuse, garbage, sewage effluent, industrial waste, oil, mine tailings, mine drainage water, mineral salts, or other pollutants. Appropriate measures will be taken to prevent leaching of water from the ash disposal area into ground water.

The Company will install a packaged sanitary waste-water treatment system for the Station and the coal mine. Utilizing extended aeration, the unit will effect a 90% reduction of suspended solids (SS) and biochemical oxygen demand (BOD). The effluent will then be chlorinated to at least a one (1) p.p.m. free chlorine residual and sent to a holding pond for not less than 4 days. During this time, BOD and SS levels will be further reduced. Holding pond effluent will either be recycled in selected Station processes, or totally evaporated in an evaporation pond.

The Company's statement outlining its assessment of the effects of water use and control on the fishing and recreational interests in the area has been previously referenced (3.1.8). The Bureau of Sport Fisheries and Wildlife, the Forest Service, and Utah Division of Wildlife Resources are studying the proposed water use with the objective of developing operational modifications for optimum fishery values.

4.7 Transmission Line

Section 3.1.13 describes the measures that were taken to minimize adverse environmental impact of the 365-mile Camp Williams-Four Corners 345-KV transmission line. Wood poles have been used along most of the route to reduce visual impact on the natural terrain and vegetation. Construction of access roads was kept to a minimum. In most cases, existing roads were improved to serve the purpose. The small amount of land leased and used for roads will be reseeded or replanted wherever this can practically be done to restore the vegetative cover.

4.8 Fish and Wildlife

Measures are being taken to protect and enhance fish and wildlife values, as outlined in sections 3.1.8 and 4.6.2. As mentioned, loss of big-game lands as a result of the Station construction will be partially mitigated by substitution of similar land areas for range use. As a part of the consideration for the transaction with the Utah Division of Wildlife Resources by which the Huntington Plant Site was secured, the agreement called for the transfer to the Division of Company land suitable for range land and to purchase for the Division other lands suitable for such purposes until agreed consideration had been expended. Thus far an exchange of approximately 201 acres of Company property at the mouth of Summit Creek near Santaquin has been consumated. Also, exchange has been agreed upon with respect to approximately 170 acres of Company property near the mouth of Blacksmith Fork Canyon near Hyrum, Utah. Additional properties are being investigated and will be purchased and exchanged as found suitable by the Division of Wildlife Resources. The Company has agreed to fence only that portion of the Station property which is required for its facilities. The remaining land will be reseeded by the Company and will remain as a winter range for big game.

4.9 Forest Highway Relocation

Federal Highway Administration will cooperate with Forest Service and BLM to ensure that protection and enhancement of environmental values are given full consideration in the design and construction of the relocated highway. Section 3.1.10 gives further details on this matter.

4.10 Dam and Reservoir

The reservoir will be operated as much as possible in furtherance of the objective to enhance fishery values, and provide water-oriented recreational opportunities. See Section 3.1.11 for additional information on these features.

The Department of Natural Resources of the State of Utah has been requested by the Forest Service to prepare a master plan for development of recreational uses of the reservoir in consultation with the Forest Service. The basis for sharing costs of the proposed development is yet to be determined.

The Company has agreed to relocate the remnants of the coke ovens on the site of the old coal town of Connelsville, which will be inundated by the reservoir, and to provide protective facilities and plaque. It will also provide suitable boat dock nearby, and construct some camping facilities if suitable maintenance provisions can be worked out with the State Department of Natural Resources.

4.11 Sediment Control During Construction

The Company will take necessary measures to prevent sediment resulting from construction activities endangering fish habitat.

4.12 Ash Disposal Area

The Company plans to use earth to cover ash deposits taken from the area immediately adjacent to the ash disposal site. Soils vary in consistency from fine clay and silt to sandy gravel, with some rock. The material will be generally selected which will support growth of sagebrush and grasses native to the area. However, the Company believes that specific preparation to remove rocks, for example, is not believed necessary or even desirable in order to achieve an eventual undisturbed appearance. This appears to be a reasonable approach.

A detailed plan outlining specific locations and fill depths has not as yet been developed. However, such a plan will provide for placing ash in generally continuous deposition within a single "live" storage area. When it is practical for economic or other reasons to suspend placement for an extended period or to permanently abandon a specific storage area, this area will be considered as "dead" storage and covered with earth to prevent blow-away to restore the natural appearance.

4.13 Monitoring

The comprehensive air and water monitoring system being provided by the University of Utah and Brigham Young University are outlined in the Appendix (A-35 and A-37). Copies of voluminous reports covering the work to date are available for inspection from the Company. The Company intends that the University of Utah and Brigham Young University will install such monitoring systems and perform such studies as are necessary to fully describe the air and water quality impact of the Station. As a result of the NOAA studies it is contemplated that approximately ten additional monitoring stations will be required at locations in the high terrain adjacent to the plant in order to accurately determine the validity of the NOAA model. Recommendations are now being prepared by North American Weather Consultants and the University of Utah on a monitoring system in the high terrain which will be adequate to control station operations if necessary in order to maintain all air quality standards and to provide a guide for the air pollution control equipment on the initial and subsequent units.

5. ADVERSE EFFECTS WHICH CANNOT BE AVOIDED IF PROPOSAL IS IMPLEMENTED

5.1 Emissions

The National primary and secondary ambient air quality standards and State standards for SO_2, NO_x, and particulates will not be exceeded, but some pollutants will be emitted from the stacks, as discussed in Section 3. The relatively small contribution of particulates and SO_2 from this Station are not expected to have a serious impact on visibility, except when plume centerlines impact high terrain NE of the Station, which is expected to be about 1% of the time. (See Section 3.)

5.2 Aesthetic Impact

The Station, transmission line, dam and reservoir, and relocated Forest Highway will all cause visual impacts. The effects of such impacts are largely subjective, although some elements, such as coal piles, coal conveyors, and stacks could be unqualifiedly classed as adverse visual impacts. Many of the visually adverse impacts will be hidden from view from major roads.

5.3 Effects of Dam and Reservoir, and Water Use

Some destruction of stream fishing will result from the dam and reservoir, and the water diversion to the Station, as discussed in Section 3. Some temporary disruption of fish habitat may be caused by sediments from construction activities.

5.4 Other Effects

Some displacement of wildlife and range animals will occur, as discussed in Section 3.

6. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The use of the coal resources of the country for generation of energy is controversial as it relates to short-term and long-term use or conservation of natural resources.

The destruction of vegetation that will result from direct construction activities is not serious.

The National primary and secondary ambient air quality standards are those which are judged necessary to protect the public health and welfare (including vegetation) with an adequate margin of safety. These standards are subject to revisions as further research is conducted. Although the Company cannot be solely responsible for ambient air standard compliance, emission standards will undoubtedly be adopted in the future applying to the operation of the Station.

Concern has been expressed about permanent atmospheric changes that might be partially attributable to stack emissions. The science dealing with this subject cannot predict what the changes, if any, might be. The possibility of cumulative effects is discussed in Chapter 3.

The use of coal for generation of electrical energy appears to be imperative for many years in the future. Although there are many advocates of a policy to decrease the use of energy, the best current projections show that electrical energy demands will continue to increase. Until there are advances in technology, there will be some environmental impact effects associated with supplying this demand.

Reduction of visibility and damage to scenic values from chemical reaction of emissions have been mentioned as having possible long-range adverse effects, but in view of the Company's commitment to comply with air quality standards, these effects are expected to be minor.

Long-term enhancement of water-oriented recreational values should occur. Access by road to public lands will be greatly improved.

7. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The principal resources to be consumed will be the estimated 1 million tons of coal to be used annually for the first 430-MW unit, or an average of 4.3 million tons for the ultimate 2,000-MW capacity.

Approximately 150 acres of national forest land will be taken out of forage or timber production by the road relocation. Use of the land inundated by Electric Lake will be lost for forage production and about 4.5 miles of stream fishing and the propagation potential of this reach of stream.

8. ALTERNATIVES TO HUNTINGTON CANYON GENERATING STATION AND TRANSMISSION LINE

8.1 No Station

A decision at this time to halt construction of the Station would itself have significant adverse impacts. Among these would be the loss of approximately $37 million that has been expended on materials, equipment, and labor.

The loss of electrical energy by not completing the Station would result in a severe shortage in available power in the Company's system. The Western Systems Coordinating Council estimates the Company's system load at 1,400-MW in 1974, as compared with 1,100-MW in the summer of 1971. The Company forecasts show a summer peakload requirement in 1974 of about 200-MW above what its existing resources at that time will provide. Additional capacity appears essential to meet the projected demand for electrical energy on the Company's system. The Company's peakload and peaking capability are shown on a chart in the Appendix (A-38). The Federal Power Commission's January 21, 1972, letter, copy included in Section 9 hereof, also analyzes the need for the Station.

Favorable economic and social impacts associated with the construction and operation of the generating station would not materialize. This is an important factor in Emery County where this Station is located.

Land, coal, and water resources to be utilized in the Station would remain undeveloped or under-utilized.

If the Station were not constructed, it would not contribute effluents to the atmosphere, there would be no ash disposal problem, and water and coal would be available for other uses. It is doubtful, however, if the coal resource would otherwise be used, and the use of water for industrial purposes appears to be a beneficial use.

8.2 Alternative Station Sites

Fuel costs based on coal company and railroad quotations were estimated for a total of seventeen sites. Twelve of these sites are located in Utah. Six of the sites investigated were in Emery County, three in Salt Lake County, two in Carbon County and one in Grand County. Two sites were in Idaho, two in Wyoming and one in Colorado. Comparative plant and transmission investment cost estimates were made with respect to 12 of these sites. The remaining sites considered were not evaluated in detail because of water supply, apparent costs or other reasons. Of the twelve sites receiving detailed study, nine sites were remote from population centers where stack effluents would not be additive to existing air pollution stemming from transportation and industry. One of the sites would have significant environmental impact on a recreational area.

8.2.1 Factors Considered in Site Selection

The factors considered in the evaluation of the various sites included:

1. Availability and cost of fuel and water.

2. Transmission line locations and cost and their environmental impact.

3. The prospective location with respect to overall system reliability and efficiency.

4. Environmental considerations of the Station, such as:

   (a) Stack gas dispersion
   (b) Fumigation and inversion conditions
   (c) Aesthetic factors
   (d) Water quality effects
   (e) Impact on fish and wildlife
   (f) Noise impact
   (g) Effect of coal-mining operation
   (h) Effect of necessary road relocations

5. Topography

8.2.2 Advantages of Huntington Canyon Site

Based on the foregoing factors, the Company decided that the Huntington Canyon site offered the following advantages over alternative sites:

1. The location of the Station near the mouth of a canyon was believed to offer some advantages in maintaining air quality because of the natural air movement--a condition which the Company had observed in other of its generating station locations.

2. The coal conveyance system, reserve coal pile, and ash disposal area do not intrude excessively on the environment. These features are not visible from the present roads or the Station site.

3. The route of the transmission line could be located to comply with environmental standards of agencies administering the land on which the transmission line was to be constructed.

4. The water supply facilities could be constructed and operated to minimize adverse effects and, in some respects, to enhance fishing and recreational values.

5. The Station would be a boost to the economy of a sparsely settled county with a small tax base.

6. The economics of the Huntington Canyon site were favorable, and the Station would fit well into the Company's overall system.

7. The necessary road relocation could be accomplished without serious environmental degradation and, in fact, would have some beneficial impact.

8. The location of the coal supply near the site minimizes the environmental impact caused by tranporting coal.

The Company's decision appears to be well supported by the facts.

The Federal Power Commission, in its January 21, 1972, letter commented that:

> "Given the increasing requirement for power in the Company's service area and in the entire Pacific Northwest, the geography of locally available fuels, the present state of delay in the nuclear power industry, and the existing general power supply deficiency of the utility companies of the Western Systems Coordinating Council, there appear to be no alternate sources of supply superior to a generation station at Huntington Canyon."

2.3 Several Smaller Plants

Single-plant construction is preferable to multiplant for many reasons, including economic considerations. Control of flue gas emissions from a large plant will likely attain slightly better efficiency and lower unit costs than the accumulated efficiency of two or more smaller plants with the same total capacity.

The economy of improved air pollution equipment for air contaminants, such as SO_2, may be better at one large plant. The construction of many small plants would require significant increases in right-of-way requirements for transmission lines, access roads, coal-hauling routes, plantsites and substations, and ash disposal areas.

2.4 Curtailment of Use of Electrical Energy

Some conservationists and others point to the tremendous increase in use of electrical energy in the United States, and the alarming prospect that this growth represents in adverse environmental effects. Mr. Charles F. Luce, Chairman of the Board of Consolidated Edison Company, in a talk at Indiana University of Pennsylvania, October 19, 1970, stated:

> "Nationally, population growth has dropped to about 1% per year, but electric loads are still going up about 8% per year. Even if we achieved zero population growth, the demand for energy would continue approximately to double every decade."

Action has been advocated to slow this great expansion in use of electrical energy so that construction of generating stations could be reduced. Curtailment of electrical energy use involves major considerations of national import. Consumption of electrical energy in the United States by class of customer in 1968 was approximately as shown on the following page.[11]

	Percent	Millions of KWH
Residential	33	380,460
Commercial	22	257,405
Industrial	45	519,145

This breakdown of electric energy consumption points out the complex factors that would be encountered by limitations in use of electricity. Some industrial leaders share public concern about encouragement of consumption. The Chairman of the Board of Consolidated Edison, in the talk referenced above, stated, in talking of the problems facing the utility industry:

> "But I believe that the problems also must be approached from the other end--from the consumers' end--and that a National policy of electric energy conservation will become necessary."

There is very good argument that attempts to reduce power consumption would have the reverse effect intended; for example, quoting John W. Simpson, President of Westinghouse Power Systems Company, in a talk on February 19, 1971, to the St. Louis Electrical Board of Trade:

> "Immense amounts of electricity would be needed in the future to insure social and economic growth and to clean up environmental pollution. To freeze or attempt to cut back on power consumption would have disastrous consequences that would dwarf our present environmental problems by comparison. Producing electric power causes certain environmental effects, but those who would reduce power output and consumption have not considered the environmental effects of not producing enough electrical power. Population growth, higher living standards, economic expansion, and agricultural production will cause increasing demand for electric power and, in addition, new uses for electric power, including new technologies to clean up pollution and treat wastes which will create further demands for electricity."

8.2.5 Substitute Fuels and Energy Sources

Fuels, other than coal, for a generating station of the size required initially to meet projected loads were investigated by the Company with the following conclusions:

1. Nuclear.--Extensive investigations proved that nuclear energy would be highly uneconomical for a generating station with the relatively small inital capacity required by the Company. It was also recognized that nuclear energy posed environmental considerations of grave concern. Further, the long lead time would have made it impossible for the Company to meet its load demands.

2. Oil and gas.--Investigations showed that there were no long-term supplies that could be committed.

3. Geothermal.--Although the Company is interested in utilization of possible geothermal resources in its service area, investigations have not proceeded to the point that large capacity geothermal units could be committed. Extensive drilling and testing of possible geothermal sources will be necessary to determine if a long-term supply is available, and if this source of power is economically feasible.

   Potential adverse environmental impacts that may be associated with geothermal resource use include:

   (a) Land subsidence can occur because of compaction of the reservoir materials as fluid is removed and reservoir pressure decreases. Subsidence may be negligible in an isolated area, but in a developed area, the adverse impact can be severe.

   (b) Fluid injection to alleviate land subsidence impacts will require liquid in the amount removed by the operating well. The purpose of fluid injection is to maintain the status quo of fluid pressure thereby preventing subsidence or earthquakes.

   (c) Water removed with the steam can be utilized, depending upon the amount and its quality. There will need to be some system of utilizing this product water either as injection water or as irrigation water, depending upon the quality.

   (d) There will be the need for transmission lines and substations to carry the electrical energy produced at a geothermal generating station; therefore, the impact of these transmission lines will be generally the same as outlined herein.

   (e) Noise can be a byproduct of a geothermal well; therefore, this environmental aspect will have to be confronted.

   (f) Emissions of steam and gas to the air can occur during testing of the well. Some of these gases are noxious and will have to be handled accordingly.

   (g) There are the possiblities of spills and leaks as well as a blowout during drilling. These potential environmental impacts will have to be considered in geothermal resource use.

   (h) There are some impacts to the local area by the exploration process; however, these are usually minor and can be kept to a minimum by good exploration practices.

4. Solar.--The Company is interested in and cognizant of solar energy research, but this source of energy will not be available in time to meet its load demands.

The Company will continue to evaluate substitute fuels as additional generating units are planned, and as technology advances.

The Federal Power Commission, in its January 21, 1972, letter stated about this Station that:

> "Oil and gas as a substitute fuel for a large coal-fired generating station is impractical at this time because of the lack of availability of sufficient quantities of these fuels in the Applicant's area. The lead time required to bring such a nuclear facility on line precludes nuclear generation as an alternate for this unit. The importation of power from outside the service area of a company can sometimes serve as a means of delaying construction of needed generating capacity for a year or two, but such an arrangement is not a realistic alternative when the other systems in the region are themselves facing deficiencies in generating capacity such as is the outlook for the Pacific Northwest in the future."

8.2.6 Gasification

Some suggestions have been made that coal gasification should be considered which would replace the coal haul to the Station with a similar haul to a chemical gasification complex. The resulting gas could be transported by pipeline to generating station locations.

DHEW publication, "Control Techniques for Sulfur Oxide Air Pollutants,"[1/] in considering the subject of gasification of coal, states:

> "The four major processes for obtaining from coal a gas with heat contents of 900 to 1,000 B.t.u. per cubic-foot use variations of gasification--methanation. These processes are hydrogasification, CO_2 acceptor, molten salt, and two-stage superpressure. Much development is necessary if any of these four processes are to become commercially feasible in the next decade."

Major programs for the development of coal gasification processes will be undertaken by Department of the Interior. Some industrial organizations are presently designing plants for coal gasification. If a feasible process is developed, the Company would consider this source of fuel in future units. Some of the same environmental impacts associated with burning coal would be present in the gasification process, but emission impacts would likely by greatly reduced.

8.2.7 Underground Transmission Line

With the present state of technology, an underground 345-KV transmission line could be run a distance of approximately 20 miles before a reactor station would be required to correct the power factor. Such a system is estimated to cost some 26 times as much as an overhead line.

The environmental impact of an underground line would be similar to that of a pipeline and could be more severe than an above-ground line, especially in regions where erosion is significant. There would be a continuous point-to-point interruption of the ground in undergrounding, as opposed to an intermittent interruption of the ground in installing towers; thus in light of the extra costs involved, as well as the impact on the environment, an underground line does not appear feasible at this time.

2.8 Dry-Cooling Towers

The Company did not make an exhaustive study of the use of dry-cooling towers, which would save large quantities of water if they were practical, because of information available to it that such towers were impractical based on:

1. Large size of dry-cooling towers would introduce an additional adverse visual impact and require more land.

2. High cost.

3. Very limited experience on units as large as this Station under similar atmospheric and meteorologic conditions.

2.9 Alternative Reservoir Sites

Several dam sites were investigated to obtain approximately 30,000 acre-feet of storage in the Huntington Canyon drainage area. Three sites were considered on the Left Fork of the Huntington in addition to the possible enlargement of existing dams. However, because of the limited drainage area in the Left Fork, the Company determined that a reservoir would have to be constructed at a location on Huntington Creek.

The following sites were considered on Huntington Creek:

Site	Volume of Fill
Bear Canyon	1,700,000 Yd^3
Valentine Gulch	3,000,000 Yd^3
Woodward Canyon	4,450,000 Yd^3
Immediately below Left Fork of Huntington	6,000,000 Yd^3
Horse Canyon	5,000,000 Yd^3
Between Deer Creek and Brockbank	4,600,000 Yd^3
Brockbank	6,800,000 Yd^3

The site immediately below the Left Fork would back water up both Huntington Canyon and the Left Fork. There is no road in the Left Fork but there is a foot trail for fishermen and hikers, and the area should be given environmental consideration to remain as a wilderness area.

All of the damsites above the Station will provide a more regulated stream, increase minimum flows, and decrease floods.

The sites below the Station would not regulate stream flow in the canyon. Both sites would require more extensive spillway facilities and deep cut-off walls because of the much greater depth to bedrock.

All sites between the Station and Bear Canyon would require relocation of State Highway 31 in extremely rugged terrain around the reservoir causing more extensive scarring on the mountainsides.

From the above tabulation it can readily be seen that Bear Canyon Site which was selected, is by far the best one from an engineering standpoint. In addition, the Bear Canyon Site has several environmental and recreational advantages. The road relocation here would cause less impact due to better terrain. Further, this road would provide better access (now very poor) to other scenic and recreational areas in the vicinity. With the reservoir at this site the recreational facilities can be reached easily from both Emery and Sanpete counties.

9. CONSULTATION AND COORDINATION WITH OTHERS

9.1 Consultation and Coordination in the Development of the Proposal and in the Preparation of the Draft Environmental Statement

A preliminary Statement on the Station and Transmission Line (March 1971) was submitted to CEQ and to about 300 agencies, organizations, and individuals for review and comment in April 1971. The comments received from this distribution were incorporated where practical in a later report (June 1971), which served as a basis for comments and impacts from the Federal agencies at the field level--Bureau of Reclamation, Bureau of Land Management, Bureau of Sport Fisheries and Wildlife, Forest Service, and Federal Highway Administration--that are directly involved in the project, as well as the Company and its consultants. The Bureau had the benefit of comments made at general and public meetings held by the Company June 5, 1970; December 2, 1970; March 12, 1971; and April 28, 1971; where the project was explained and comments solicited. Meetings among representatives of the Federal agencies previously listed were held, as necessary, during the course of preparation of the draft Environmental Statement to assure full consideration of the opinions and expertise of these agencies.

9.2 Coordination in Review of the Draft Environmental Statement

The draft Environmental Statement was distributed for review and comments to the agencies, organizations, and individuals listed in the Summary.

A press release notified the public of the general nature of the draft Environmental Statement, and where it could be reviewed and copies obtained.

Responses to the request for review of the draft Environmental Statement were received as indicated on the list in the Summary. Copies of the responses are attached.

Most of the suggestions for inclusion of additional material in the Environmental Statement have been accomodated in the final Environmental Statement. As a practical matter it is not possible to comply with the suggestion by Peabody Coal Company that the Government endorse all of the comments attributed to the Company in the Environmental Statement. The question raised by Jeanne Torosian on the ultimate disposal of the buildings, transmission line, and other facilities has not been treated in the Environmental Statement due to the impossibility of projecting the ultimate disposition of the property. The criticism in John M. Herbert's letter regarding objectivity of the draft Environmental Statement has been noted. The Environmental Statement has been re-examined from this viewpoint with the purpose of reinforcing objectivity. Concern is expressed by some reviews that 10-year intervals are too long for review of technology in air and water quality control equipment under the terms of the proposed water supply contract. The period of review will be shortened if technological developments indicate the desirability of this. Much additional information was added to accommodate EPA suggestions.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
WASHINGTON, D.C. 20240

DEC 17 '71

Memorandum

To: Commissioner, Bureau of Reclamation

From: Director, Bureau of Sport Fisheries and Wildlife

Subject: Huntington Canyon Generating Station and Transmission Line - Review of Draft Environmental Statement

This is in response to your request of September 30 for review of the subject statement. We are sorry to be so late in reply; but, as explained to members of your staff, this report did not surface in our Bureau until late November of this year. We have appreciated the opportunity to participate in the preparation of the Environmental Statement. In general, we find the statement to be satisfactory and have only a few minor suggestions.

On page 44 after the first sentence of the second full paragraph, this sentence could be added: "It is noted, however, that the Company's views on fisheries of Left Fork of Huntington Canyon and streamflows below the powerplant differ from those described herein that are based on findings of biologists of the fish and wildlife agencies."

The last three sentences of the first paragraph on page 63 could be deleted. They repeat material contained in previous discussions of fish and wildlife.

The comprehensive Southwest Energy Study could appropriately be mentioned on page 73 as a reference for the description and consideration of cumulative impact considerations.

We appreciate the opportunity to comment on the Draft Environmental Statement for Huntington Canyon Generating Station and Transmission Line.

Willis King

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

1791(220)

NOV 1 2 1971

Memorandum

To: Commissioner, Bureau of Reclamation

From: Assistant Director, Bureau of Land Management

Subject: Review of Draft Environmental Statement--Huntington Canyon Generating Station and Transmission Line

Members of my staff have reviewed the subject Draft Environmental Statement and offer the following comments:

1. The decision to consider environmental impact on only the first 430 MW unit needs review considering present day economics of coal-fired thermal generating plants and action by Utah Power & Light Company which indicates that they are apparently preparing for future units. Indications are that other units may be necessary to economically justify development aspects of this plant. The company is known to have proceeded with acquisition of water rights which would allow further developments. The scale of features like "Electric Lake" at 30,000 ac. ft. storage capacity is relevant. Allowance of one unit may commit resources beyond those necessary for that unit. Should development be considered at this point in time? See Departmental Manual 516.2.

2. The impact of allocation of water in the Emery County area to the generating station is not analyzed as to impact on irrigated agriculture in the county.

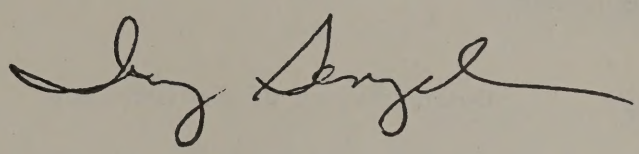
3. The report may be too general in certain areas, including identification of pollutant fallout areas and anticipated impact on various plant communities. The section entitled "Vegetative Effects" cites professional papers but does not show their application to the immediate area of concern.

4. Health hazards of mercury and radionuclide contamination may be treated too lightly. Adverse impacts to fish may be a serious problem in this area due to the many fishing opportunities.

5. The Draft Environmental Statement mentions developing "feasible" control processes for SO_2, NO_2 and NO_x. Is this in terms of economic

issues or does it include protection of the environment, ecology and public health?

6. Is the 5 to 10 year technological review period too lengthy in view of unknown environmental impacts and the possibility of technological breakthroughs from intensive research? Are annual reviews feasible?



United States Department of the Interior

BUREAU OF INDIAN AFFAIRS
WASHINGTON, D.C. 20242

IN REPLY REFER TO: 390 WR

Memorandum

NOV 01 1971

To: Commissioner of Reclamation

Through: Assistant Secretary
Public Land Management

From: Commissioner of Indian Affairs

Subject: Review of September 17, 1971, Draft Environmental Statement for the Huntington Canyon Generating Station and Transmission Line, Utah

Pursuant to your memorandum of September 30, please be advised that subject NEPA draft statement has been reviewed from the standpoint of particularized Indian interest. Such interests were found to be adequately protected to the very limited extent they were present.

John O Crow
Deputy Commissioner

United States Department of the Interior

BUREAU OF OUTDOOR RECREATION
WASHINGTON, D.C. 20240

REPLY REFER TO:

OCT 8 1971

Memorandum

To: Commissioner of Reclamation

From: Director, Bureau of Outdoor Recreation

Subject: Review of September 17 Draft Environmental Statement for the Huntington Canyon Generating Station and Transmission Line

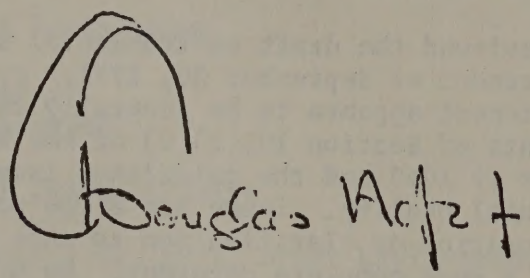
We have reviewed the draft environmental statement transmitted by your memorandum of September 30, 1971. From our viewpoint, the draft statement appears to be generally responsive to the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969 and the guidelines issued by the Council on Environmental Quality. There are a few points, however, which need elaboration or clarification to make the environmental statement a more complete document. We offer the following comments.

Stack emissions--We are concerned that the methods of treating stack emissions remain to be largely unsolved. On page (c) of the Summary, it states that stack emissions "include 33-45 tons of SO_2 per day (without removal equipment) . . . ." The statement should include a percentage reduction figure if the removal equipment were to be installed. This way we would know how many tons of SO_2 would be emitted even with removal equipment.

Review of air pollution control equipment--On page 42, it states, "No less often than once every 10 years, representatives of the Company and the Department of the Interior shall meet to review technology in air pollution control equipment . . . ." In an industry which is doubling its capacity every 8 years or so, it would appear that better control equipment should be emerging with a frequency that would dictate far more frequent discussions. On page 64, it states that "The Company will be required to submit plans to the Secretary of the Interior for his review and comment regarding noise abatement, dust abatement, and ash disposal. These plans will be subject to review at least once every 5 years to take advantage of new technology as it develops." We believe that the review of air pollution control equipment is at least as important as these other problems. Perhaps even an annual meeting with the Company and this Department concerning air pollution control should be advised.

Recreation--We agree that the development of Electric Lake should provide for additional recreation opportunities dependent or related to water. However, the environmental statement should include a complete assessment of the recreation potential and a description of the facilities that will be provided to utilize the recreation capability. A timetable should be included showing dates of initial construction and completion of recreation facilities. A statement is needed on who is going to absorb construction costs and who will be responsible for operation and maintenance of the recreation facilities following completion.

We appreciate the opportunity for offering these comments.



OFFICE OF THE DIRECTOR

United States Department of the Interior

BUREAU OF MINES
WASHINGTON, D.C. 20240

October 15, 1971

Memorandum

To: Commissioner of Reclamation
Through: Assistant Secretary--Mineral Resources

OCT 2 1971

From: Director, Bureau of Mines

Subject: Review of draft environmental statement for the Huntington Canyon Generating Station and Transmission Line

The subject draft environmental statement has been reviewed by the Bureau of Mines in accordance with your cover memorandum of September 30, 1971.

We feel that the following items require clarification or additional information for completeness.

p. 18 - The historic significance of Connelsville is not described in the statement. As this site will be inundated by Electric Lake, more information on the value of the site and alternatives for its preservation, if desirable, should be included.

p. 46 - The covering of ash in the disposal area is not sufficiently treated. What is the nature of the proposed "earth" covering? Will this be top soil, clay, rock, or some other material? What will be the thickness of cover and the time sequence for placement of cover?

p. 46 - Does flash flooding occur in this area and, if so, will the diversions for up valley runoff be sufficient to protect the ash disposal site?

With the exception of the above points, we find no objection to the program as defined in the environmental statement. Provisions for environmental protection reflect considerable research activity and are quite complete. Environmental damage at the 430 mw generating level should be minimal.

Director

Enclosure

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

November 8, 1971

Mr. Ellis Armstrong
Department of Interior
Bureau of Reclamation
Washington, D.C. 20240

Dear Mr. Armstrong:

We have had the draft environmental statement for the Huntington Canyon Generating Station and Transmission Line reviewed in the relevant agencies of the Department of Agriculture, and the only comment we wish to make is to point out that a considerable amount of vegetation and soil will be disturbed by the project with which this draft statement is concerned. Assistance in minimizing soil erosion and sedimentation during construction is available from the Soil Conservation Service through local soil and water conservation districts.

Two copies of the statement are rendered herewith.

Fred H. Berkley

for T. C. BYERLY
Coordinator, Environmental
Quality Activities

Attachments

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

OCT 22 1971

Honorable Ellis L. Armstrong
Commissioner, Bureau of Reclamation
U. S. Department of the Interior
Washington, D. C. 20240

Dear Mr. Armstrong:

This is in response to your letter dated September 30, 1971, to Mr. Joseph J. DiNunno concerning the draft environmental statement for the Huntington Canyon Generating Station and Transmission Line. We have reviewed the statement with respect to radiological matters and have no comments to make.

Sincerely,

A L Henderson

for Director of Regulation

cc: Mr. Timothy Atkeson
Council on Environmental
Quality (10)

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426
January 21, 1972 IN REPLY REFER TO:

Mr. Ellis L. Armstrong
Commissioner
Bureau of Reclamation
U. S. Department of the Interior
Washington, D. C. 20240

Dear Mr. Armstrong:

This is in reply to your letter of September 30, 1971, requesting review and comments by the Federal Power Commission on the Draft Environmental Statement dated September 17, 1971, covering the Huntington Canyon Generating Station and associated transmission line of the Utah Power and Light Company. The construction of the transmission line has been completed and the line was energized on June 26, 1971. The in-service date of the first unit of the generating station is scheduled for June 1974.

These comments are in accordance with the National Environmental Policy Act of 1969 and the Guidelines of the Council on Environmental Quality dated April 23, 1971. The environmental aspects of the proposed facilities must be analyzed thoroughly. We understand that will be done. These comments are directed solely to a review of the need for the facilities as concerns the adequacy and reliability of the bulk power electric system and alternates to the methods proposed to be used. They are based on the September 17, 1971, Draft Environmental Statement jointly prepared by the Department of the Interior, the Department of Agriculture, and the Department of Transportation, the Applicant's Power System Statement for 1970 submitted to this Commission; and the Western Systems Coordinating Council's April 1, 1971 response to this Commission's Order No. 383-2 concerning the adequacy and reliability of electric service.

The Need for Proposed Facilities

The Huntington Canyon Generating Station is to be coal fired, and the first unit is to have a capacity of 430 megawatts. The second unit is expected to be needed no later than 1978. The station may ultimately have a total generating capacity of approximately 2,000 megawatts. The station site is approximately 29 miles southwest of Price, Utah. The source of coal will be an underground mine about two and one-half miles from the plant site. Various Federal agencies have jurisdiction over certain lands and waters which are involved in this project.

The transmission line, which is now part of the Applicant's system, extends roughly through the plant site interconnecting the Salt Lake City area and the Four Corners area.

Mr. Ellis L. Armstrong

Since the Utah Power and Light Company is part of the Northwest Power Pool, the need for the proposed plant is analyzed below on the basis of the power supply situation in both the Applicant's own service area and that of the Northwest Power Pool as these are expected to develop by 1974.

	Utah Power and Light Company		Northwest Power Pool	
	1974		1974	
	Summer	Winter	Summer	Winter
Peak Load (Megawatts)	1,707.3	1,531.9	24,485	31,067
Generating Capacity, including Huntington Canyon (Megawatts)	1,787.5	1,787.5	33,748	35,872
Reserves, including Huntington Canyon (Megawatts)	80.2	255.6	9,263	4,805
(Percent)	4.7	16.7	37.8	15.4
Reserves, without Huntington Canyon (Megawatts)	(349.8)	(174.4)	8,833	4,375
(Percent)	(20.5)	(11.4)	36.1	14.1

At the present time the Utah Power and Light Company is a summer peaking system. This situation is expected to continue at least through 1974. At that time the net dependable capacity owned by the Company, including the capacity of the Huntington Canyon Generating Station, is expected to exceed the peak load by 80 megawatts, a reserve capacity of only 4.7 percent. It appears then, that if the Company is to meet its obligations to its customers, it will have to continue to depend on substantial purchases of power since it is highly unlikely that the reserve level indicated will be sufficient to meet normal maintenance plus forced outage and other emergency contingencies.

The Northwest Power Pool, of which the Utah Power and Light Company is a member, is a winter peaking pool. In 1974, the Pool is expected to have a reserve capacity of 15.4 percent which will include Huntington Canyon. Without the Huntington Canyon Unit, the Pool's reserve margin would be 14.1 percent.

On the basis of the foregoing analysis, it is obvious that the Huntington Canyon Generating Station will be needed in 1974 by the Utah Power and Light Company and by the regional pool of which the Company is a part.

Mr. Ellis L. Armstrong

Transmission Lines

The prime market for the power from the Huntington Canyon Generating Station is the Salt Lake City load center of the Applicant's service area where approximately 70 percent of the Applicant's load is concentrated. The peak load of this area in 1970 was 880 megawatts and is expected to grow to 1,760 megawatts in 1980 and 3,540 megawatts in 1990. Thus the 345-kilovolt transmission line running northwest about 100 miles to the Salt Lake City load center is a necessary consequence of the Company's decision to construct a mine-mouth plant at the Huntington Canyon site.

The section of 345-kilovolt transmission line running southeast approximately 250 miles to the Four Corners Areas will strengthen the interconnections between the systems of the Pacific Northwest and those of the Pacific Southwest and contribute to the general interchange capability and improve stability of the western bulk power transmission network. These considerations lead us to conclude that both branches of the 345-kilovolt transmission line stretching northwest and southeast of the Huntington Canyon Generating Station are important components of the proposed generating facility which will have a beneficial influence on the stability of the entire western transmission network, particularly in the area along the eastern side of the north-south loop.

Alternates to Huntington Canyon

Given the increasing requirement for power in the Company's service area and in the entire Pacific Northwest, the geography of locally available fuels, the present state of delay in the nuclear power industry, and the existing general power supply deficiency of the utility companies of the Western Systems Coordinating Council, there appear to be no alternate sources of supply superior to a generation station at Huntington Canyon.

Consideration of a number of smaller installations at different sites appearsto offer no advantage over the higher operating efficiency and diminished total environmental impact of a large central station. Oil or gas as a substitute fuel for a large coal-fired generating station is impractical at this time because of the lack of availability of sufficient quantities of these fuels in the Applicant's area. The lead time required to bring such a nuclear facility on line precludes nuclear generation as an alternate for this unit. The importation of power from outside the service area of a company can sometimes serve as a means of delaying construction of needed generating capacity for a year or two, but such an arrangement is not a realistic alternative when the other systems in the region are themselves facing deficiencies in generating capacity such as is the outlook for the Pacific Northwest in the future.

Mr. Ellis L. Armstrong

Staff members of the Federal Power Commission's Bureau of Power are participating in the work of the Power Development and Economic Effects Work Group of the Department of Interior's Southwest Energy Study Task Force and the Huntington Canyon Generating Station is one of the generating plants included in the study. Also Chairman Nassikas' statement before the United States Senate Committee on Interior and Insular Affairs on November 10, 1971, included remarks about the forecasted demand for electric power generation in the Pacific Southwest and the alternatives which might exist to coal-fired plants at the sites presently proposed. Appendix A to that statement was a Bureau of Power staff report on projected power developments in the Four Corners region.

Concern over air quality in the Pacific Southwest, problems of adequate cooling water supply, and delays in the licensing or construction of nuclear plants have produced a situation in the entire western region in which electric generating capacity is lagging the growing demand for electric power and steadily increasing the possibility of power shortages in the future.

Very truly yours,

Stewart P. Crum

Stewart P. Crum
Deputy Chief, Bureau of Power

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION VIII
FEDERAL OFFICE BUILDING
19TH AND STOUT STREETS
DENVER, COLORADO 80202

OCT 28 1971

OFFICE OF THE REGIONAL DIRECTOR

Your reference: 440

Mr. Ellis L. Armstrong, Commissioner
United States Department of the Interior
Bureau of Reclamation
Washington, D. C. 20240

Dear Mr. Armstrong:

This is in reply to your letter of September 30, 1971 addressed to the Assistant Secretary for Health and Scientific Affairs, in which you requested review of the Draft Environmental Statement concerning the Huntington Canyon Generating Station and Transmission Line.

It is noted that recreational activities such as camping, picnicking, boating, and fishing will increase in the impact area after the project is completed, and will require construction of additional facilities to accomodate the public. It is recommended that design of water supplies, sewage treatment plants, comfort stations, sanitary boat dumping stations, and probably fish cleaning stations be completed before construction of the power plant and reservoirs is begun. It may be found that some of the sewage and other recreational facilities can be installed more expeditiously and economically during the main construction than afterwards.

It is further recommended that reservoirs and ponds be designed and operated to minimize the breeding of disease-carrying and nuisance mosquitoes.

With respect to these recommendations, your attention is invited to the following Public Health Service publications:

Environmental Health Practices in Recreational Areas, PHS Publication No. 1195

Prevention and Control of Vector Problems Associated With Water Resources, January 1965

When the final Environmental Statement is developed as required by Sec. 102(2)(c) of the National Environmental Policy Act, it is requested that you send your request for comments to:

Assistant Secretary for Health and Scientific Affairs
Department of Health, Education, and Welfare
Washington, D. C. 80201

Sincerely,

Rulon Garfield

Rulon R. Garfield, Ph.D.
Regional Director

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

[redacted]

REGION NINE
UTAH DIVISION
P. O. Box 11563
125 South State Street
Salt Lake City, Utah 84111

December 2, 1971

Mr. D. L. Crandall
Regional Director
Bureau of Reclamation
Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

Subject: Environmental Statement - Huntington Canyon

On November 17, 1971, we verbally advised your Mr. Bywater that we had no comments on the environmental statement, but we had not received a reply from our Washington and Regional Offices. We have now received a consolidated reply and no comments were offered.

Thank you.

Sincerely yours,

R. H. Gibson

for: George W. Bohn
Division Engineer

ADVISORY COUNCIL
ON
HISTORIC PRESERVATION

WASHINGTON, D.C. 20240

November 11, 1971

Dear Mr. Armstrong:

This is in response to your request for comments on the environmental impact statement identified by a copy of your cover letter attached to this document. The staff of the Advisory Council has reviewed the submitted impact statement and suggests the following, identified by checkmark on this form:

✓ The final statement should contain (1) a sentence indicating that the National Register of Historic Places has been consulted and that no National Register properties will be affected by the project, or (2) a listing of the properties to be affected, an analysis of the nature of the effects, a discussion of the ways in which the effects were taken into account, and an account of steps taken to assure compliance with Section 106 of the National Historic Preservation Act of 1966 (80 Stat. 915) in accordance with procedures of the Advisory Council on Historic Preservation as they appear in the Federal Register, February 20, 1971.

___ In the case of properties under the control or jurisdiction of the United States Government, the statement should include a discussion of steps taken to comply with Section 2(b) of Executive Order 11593 of May 13, 1971.

✓ The final statement should contain evidence of contact with the Historic Preservation Officer for the State involved and a copy of his comments concerning the effect of the undertaking upon historical and archeological resources.

___ Specific comments attached.

Comments on environmental impact statements are not to be considered as comments of the Advisory Council in Section 106 matters.

Sincerely yours,

Robert R. Garvey, Jr.
Executive Secretary

ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 10 1972

OFFICE OF THE ADMINISTRATOR

Honorable Rogers C. B. Morton
Secretary of the Interior
Washington, D.C. 20240

Dear Mr. Secretary: Log

We have reviewed the draft environmental impact statement for the Huntington Canyon Generating Station and Transmission Line, transmitted to the Environmental Protection Agency on September 30, 1971. According to the report, some $32 million have already been invested in the facilities prior to submission of the statement.

The evidence available to us at this time indicates there are a number of environmental problems associated with the Huntington Canyon project. Many of these problems are not adequately discussed in your draft statement, in part because of the absence of the necessary data. Some reports, however, prepared for the Southwest Energy Study indicate that the plant will be unable to meet national air quality standards. For that reason EPA recommends that commitments to additional capacity at the Huntington Canyon site be deferred pending further study and operating experience with the first unit.

While we must emphasize our belief that a complete report on the environmental impact of any of the projects included in the Southwest Energy Study must await the conclusion and review of the results of that study, we recognize the need to supply you with whatever information and comments we may have as expeditiously as possible. For this reason, we have enclosed our detailed comments.

The enclosed comments discuss in detail the following areas where the draft impact statement lacks information, or where the project as now planned could have particularly adverse environmental effects.

1. Impacts at the 2000 MW level.

2. SO_2 removal.

3. Visibility.

4. Impacts on vegetation.

5. Mercury emissions.

6. Disposal of fly ash and bottom ash.

7. Spoil bank stabilization.

8. Disposal of blowdown and mine drain water.

9. Ozone production.

10. Impact on trout stream.

11. Road erosion.

12. Impacts of water consumption.

13. Adequacy of mitigation.

14. Impacts of increased recreation.

15. Monitoring system.

We thank you for this opportunity to review the draft statement.

Sincerely yours,

Bill Ruckelshaus

William D. Ruckelshaus
Administrator

Enclosure

Enclosure to Letter to Honorable Rogers C. B. Morton

ENVIRONMENTAL PROTECTION AGENCY

Detailed Comments on Draft
Environmental Impact Statement

Huntington Canyon

1. The draft environmental impact statement refers primarily to the 430 MW one-unit installation. The statement indicates, however, that commitments to the 2nd, 3rd, and 4th Huntington Canyon units will probably have to be made before any environmental experience can be gathered from Unit 1. For example, page 1 states, "The first 430 MW unit... is planned to be on line in 1974... a second unit will be needed by 1978." Since the site is intended for 2000 MW of capacity, the statement should address itself to this higher level of development.

2. The 430 MW unit, as proposed, has no SO_2 controls and will emit some 33-45 tons of SO_2 per day. The statement reveals on page 58, that: "...at any time available data indicated we would not be complying with air quality standards, we would move immediately to install commercially feasible SO_2 removal equipment on the first unit..." Since SO_2 control systems are now commercially available and given the lead time for such equipment, steps should be taken to incorporate a suitable SO_2 control system into the original plant design rather than attempt to retrofit at a later date. The need for such an SO_2 control system has been identified as a result of a recent calculation based on an atmospheric model for the Southwest Energy Study done by the National Atmospheric and Oceanic Administration (NOAA). These calculations indicated that operation of unit #1, would, under varying conditions, lead to violation of the national SO_2 ambient air quality standard. This is particularly true for short-term concentrations under conditions of limited mixing.

3. The atmospheric modelling performed by NOAA as part of the Southwest Energy Study has shown that visibility will be severely reduced by stack emissions even with the control equipment included in the present design. In view of the unique clarity of the air in this area at the present time, the scenic beauty of the area, and its current use as a recreational resource, a severe reduction in visibility is difficult to justify and should be discussed extensively in the impact statement.

4. Since the plant is located in a forested area, the statement should include a discussion of the possibility of damage to vegetation. The prevalence of the up-canyon air flows with chimney effects in the upper canyon (page 10) indicates a potential problem to vegetation. The more mesic types of vegetation found in the upper canyon and on the slopes to the northwest of the lake are susceptible to SO_x and NO_x during the spring and early summer months. The literature indicates that combinations of SO_x and NO_x are considerably more hazardous than either pollutant alone. Also, since this area is important as a habitat for a number of big game ungulates, any reduction of vegetative productivity as a result of fumigation may result in a reduction in winter hardiness of the herd. The statement should also address the possibility of crop damage in the valley below the Huntington Canyon plant site.

5. The statement discusses the potential risks from mercury contamination (page 49) by stating that "...it is highly unlikely that mercury could be a problem." Yet the 430 MW unit will emit some 150 lbs. per year, while the 2000 MW plant will emit some 750 lbs. per year. Over the 35 year life of the plant, this could approach 10 tons. The statement should assess the effects of this mercury on man and the biota.

6. More details are needed on the disposal of fly and bottom ash. Topographic and other maps with cross sections of disposal sites, as well as discussions of exact plans must be presented before we can make a proper environmental assessment of this phase of the project. The possibility of disposal into exhausted mine shafts should also be discussed.

   Specific evidence should be presented to demonstrate that water which contacts the ash itself (and which thereby leaches out heavy metals or other pollutants) will be prevented from entering any stream or lake, or the ground water table. Measures should be adequate to ensure such protection under conditions of maximum probable flash flood. Details of any dikes to be constructed to achieve this protection should be included. A method of positively preventing seepage to ground water should also be discussed.

7. Vegetation and other spoil-bank stabilization measures for the wastes from the underground mine should be assessed.

8. The description of plans to dispose of blowdown water and mine drain water is not adequate. The use of settling and evaporation ponds to dispose of this effluent appears sound. Details of pond location and construction should be given, however, to allow an independant determination of whether measures are adequate to prevent these waters from entering Huntington Creek or the ground water table.

9. Since the transmission line is already constructed, we mention only the problem of ozone generation. It is an established fact that ozone is produced as a result of the design corona losses from high voltage lines. It can have a significant human health effect, can seriously damage plant life, and is a prime indicator and component of photochemical smog. Calculations available to us would indicate that about 3 pounds of ozone would be generated per mile per day at a design corona loss of 4 KW per mile. Because of the increasing proliferation of high voltage transmission lines in the Southwest, the cumulative effect of ozone production should be discussed in the final statement.

10. Although we must defer any final determination to the Bureau of Sport Fisheries and Wildlife, we wish to express our concern with the loss of several miles of high quality trout stream from inundation by the proposed Electric Lake. We are skeptical of the statement that managed reservoir releases will improve the remaining downstream fishing in Huntington Creek, because the area to be flooded is the main spawning area in Huntington Creek. We urge the utility to examine other possible storage sites.

11. Possible erosion along the proposed new road construction should be discussed, and measures to prevent such erosion should be outlined.

12. Possible reduction in the water supply to the Desert Lake Waterfowl Management Area because of water consumption at the power plant should be identified and studied.

13. Although we must defer again to the Bureau of Sport Fisheries and Wildlife for any final determination, we are concerned with the loss of vital winter big-game range at the site of the power plant and ash disposal areas, and the loss of range farther up Huntington Canyon, resulting from the construction of the storage reservoir and relocation of the Huntington Canyon Road. This area is heavily used for hunting and fishing. The proposed purchase of additional wildlife range for donation to the State to replace the public wildlife range to be occupied by the plant may be adequate mitigation. More details need to be provided, however, to allow an independent judgement as to whether this mitigation is adequate.

14. It is expected that the improved Huntington Canyon Road will increase recreational use of the area. Since the area is already very heavily used, there should be a discussion of the environmental impact of the resulting increased human pressure on the area. Scenic and natural recreation areas have a limited capacity before human use and the resulting increased pollution begins to degrade the quality of the recreational experience.

15. A major deficiency of the statement is that it has virtually no discussion on the need for, and the design of a comprehensive air and water monitoring system. Such on-going monitoring is essential to insure that the plant is not dagrading the air or surface or ground waters, and that pollution data is gathered which can improve the design of any subsequent units at the site. The statement cites numerous uncertainties (e.g., page 32) but does not indicate a program of action to help remedy the problem of limited data.

STATE OF UTAH
Calvin L. Rampton, Governor
DEPARTMENT OF
DEVELOPMENT SERVIC

Melvin T. Smith, Director
603 East South Temple
Salt Lake City, Utah 84102
Telephone: (801) 328-5755

January 6, 1972

Mr. Frank Davis, Construction Engineer
Utah Power & Light Company
1407 West North Temple
Salt Lake City, Utah 84110

Dear Mr. Davis:

We appreciate your wish to help preserve Utah's historical and cultural heritage. It is indeed a rich and varied one and deserves the interest and protection of all individuals and institutions.

The proposed Utah Power & Light reservoir development site, inundating as it does the coal town of Connellville, poses a problem for us as an organization because of our constitutional duty to preserve Utah history and recent National and State preservation acts designating the Department of State History as protectors of significant historic sites. At the same time economic development is important too. Since some middle ground is called for, we suggest the following steps as possible solutions to the problem: First, relocate the coke ovens and construct protective and historic marking structures around them. Second, establish docking and camping facilities for interested parties. We think this step is necessary because access to this historic site will be by water only. Finally, may we propose an archeological dig, to be overseen by the Historical Society and conducted by some reliable institution (possibly Brigham Young University) to recover tangible remnants and reconstruct the layout of the town site prior to inundation.

We will be happy to cooperate in any way possible in these undertakings. It occurs to us that the positive publicity accruing to your organization as a result of the effort would offset much of the criticism that inevitably occurs with the construction of a power generating operation such as you propose. We recognize the efforts you have already made to conform to the environment in the Huntington Canyon area and feel our proposals would be consistent with your interest.

Sincerely,

Jay Haymond

Dr. Jay M. Haymond
Preservation Historian
JMH:hm
ccs: K. M. Neuschwander, Utah Power & Light
Lee Kapaloski, State Planning Department

STATE OF UTAH
Calvin L. Rampton, Governor
DEPARTMENT OF
DEVELOPMENT SERVICES

Melvin T. Smith, Director
603 East South Temple
Salt Lake City, Utah 84102
Telephone: (801) 328-5755

January 11, 1971

Mr. Frank Davis, Construction Engineer
Utah Power & Light Co.
1407 West North Temple
Salt Lake City, Utah 84110

Dear Mr. Davis:

In regard to our conversation by telephone January 10 and the matter of a campground at the old townsite of Connellville, it is imperative that everything be done possible to maintain Connellville and its remnants in the consciousness of the people of Utah. Your proposed Electric Lake inundating the site obliterates the evidence of the memory of Connellville's contribution to Utah's past.

If a campground were built and maintained to attract interested parties, the effect of isolation by water of the townsite would be partially offset. However, in view of Utah Power & Light's effort to encourage government agencies to pick up the maintenance aspect of recreational facilities around the lake, any help by way of construction of camping facilities on the Connellville site should be done in anticipation of the proposed agency assumption of maintenance.

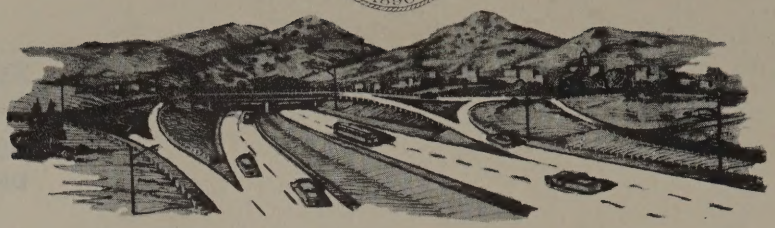
Your continuing cooperation is greatly appreciated.

Sincerely,

Jay Haymond

Jay M. Haymond, Ph.D

Director
ıry C. Helland



Blaine J. Kay
State Highway Engi

Utah State Department of Highways

State Office Building

Salt Lake City, Utah 84114

November 3, 1971

Mr. D. L. Crandall, Regional Director
Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84111

Subject: Comments on the Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line, September 17, 1971.

Dear Mr. Crandall:

The portion of the Huntington Canyon Generating Station project of concern to the Utah State Department of Highways is the relocation of Forest Highway Route 7 (State Route 31) around the proposed dam and reservoir. We have worked closely with the Division and Regional offices of the Federal Highway Administration and the Utah Power and Light Company in developing the location and alignment for the highway relocation proposal described in the draft statement.

In our opinion, all feasible alternatives for the highway relocation have been investigated and the most prudent alternate has been selected. We will continue to work with agencies initiating this project to insure that the interests of the highway user are protected and enhanced.

Thank you for the opportunity to comment.

Very truly yours,

David L. Sargent

for Blaine J. Kay, P.E.
State Highway Engineer

cc: (10) Council on Environmental Quality, Washington, D.C.
George W. Bohn, FHWA

STATE OF CALIFORNIA

Colorado River Board of California

302 CALIFORNIA STATE BUILDING
217 WEST FIRST STREET
LOS ANGELES, CALIFORNIA 90012

November 1, 1971

Mr. David L. Crandall, Regional Director
U. S. Bureau of Reclamation, Region 4
Department of the Interior
P. O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

In accordance with the notice dated September 30, 1971, which accompanied the "Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line", dated September 17, 1971, we have prepared the following comments:

The interests and concerns of the Colorado River Board of California in the proposed Huntington Canyon Generating Station are identified with the water quality aspects of the plant. Accordingly, we were pleased that the environmental statement states that "The company will prevent the return of any water to the stream to maintain water quality. . . ." This policy, similar to that adopted for the Mohave and Navajo Generating Stations, will be of assistance in minimizing the expected future increase in salinity of the Colorado River.

We also note with interest and concern the plans stated in the report for the disposal of ash from the plant. The measures proposed for ash disposal and control appear to be adequate in order to prevent mineral pollution of surface water runoff. However, the report does not indicate what actions would be taken to minimize or eliminate leaching of minerals from the ash disposal area into the ground water, with possible movement therefrom into surface streams.

Accordingly, we recommend that both the environmental statement and any pertinent contracts specify that the company be required to treat the ash disposal area so that percolation will be minimized and that a stream and ground water quality monitoring program be established adjacent to and downstream of the ash disposal area. Further, the company should be directed to make annual reports on its monitoring activities.

Mr. D. L. Crandall
November 1, 1971

We appreciate the opportunity to comment on the environmental statement for the Huntington Canyon Generating Station and the cooperation which we have always received from your office.

Very truly yours,

M. B. Holburt

MYRON B. HOLBURT
Chief Engineer

cc: Council on Environmental Quality
Washington, D. C. (10)

STATE OF COLORADO DEPARTMENT OF HEALTH
4210 EAST 11TH AVENUE · DENVER, COLORADO 80220
R. L. CLEERE,

October 26, 1971

U. S. Bureau of Reclamation
Regional Office - Region 4
P. O. Box 11568
Salt Lake City, Utah 84111

RE: Your letter of September 30, 1971

Attention: Mr. O. L. Crandall, Regional Director

Dear Sir:

The proposed Huntington Canyon Generating Station is to be located about 100 air miles from the Colorado-Utah Border, considerably west of the Green River. As a result, any deleterious effect on water in Colorado appears nearly impossible.

The proposed transmission line will, according to the plan provided, cross southwestern Colorado for only a short distance. It apparently will cross the headwaters of some of the smaller tributaries of the San Juan River. Construction of the towers will almost certainly cause some roilling of these small streams during actual installation, but this should be minimal. The San Juan, in this area, is classified B2 (warm water fisheries). One of the requirements for this classification is that "No turbidity shall exist in concentrations that will impair natural and developed fisheries." Provided that adequate care is taken, during construction, to see that such turbidity control is exercised, there should be no serious impairment of water quality, in Colorado, by the construction of this transmission line.

Very truly yours,

FOR DIRECTOR, WATER POLLUTION CONTROL DIVISION

Fred Matter

Fred Matter, P.E.
Supervising P. H. Engineer

FM:dc

cc: (10) Council on Environmental Quality
Washington, D. C.

Arizona Water Commission
34 WEST MONROE STREET - 7TH FLOOR
Phoenix, Arizona 85003
TELEPHONE (602) 258-7561

October 27, 1971

Mr. D. L. Crandall
Regional Director, Region 4
U. S. Bureau of Reclamation
P.O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

Thank you for the opportunity to comment on your Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line. It is one of the best environmental statements we have received, and we are pleased to note that there will be no return flow to Colorado River Drainage.

Sincerely,

Wesley E. Steiner
Executive Director

WES:TTC:j

UTAH AUDUBON SOCIETY

SALT LAKE CITY, UTAH

October 22, 1971

E. A. Lundberg, Regional Director
Bureau of Reclamation
Regional Office Region 3
P. O. Box 427
Boulder City, Nevada 89005

Dear Mr. Lundberg:

Thank you for including me on your mailing list for Environmental Impact Statements on the Huntington and Navajo power plants. I have read both of the reports with considerable attention and have arrived at some conclusions which I present below.

As in the case of most environmental reports the control of environmental pollutants such as sulfur oxides and nitrogen oxides have not yet been solved and a design criteria of 99.5% for particulates sounds to the average laymen to be good control but still represents the escape of a significant amount of submicron particulates which are particularly bad for light interference and probably represent a public health hazard. Nowhere in the reports do I see a mention of the use of filter bags which might increase the collection percentage of particulates to approximately 99.9%.

In the case of wildlife studies it is obvious that adequate examination of the effects of power plant development has not been adequately determined and in fact it would seem to me that a control study prior to any activity would be necessary to adequately assess the eventual impact of the plants on wildlife. Even though it appears it is too late to establish an adequate control study, it would seem worthwhile to inventory mammal and rodent populations and conduct bird nesting surveys at varying perimeter distances from the plants.

Under alternative methods for obtaining power I see no mention of research into or stimulus for introduction of solar sources of power. Although this technology may be in its infancy it seems wasteful that more efforts are not devoted in this direction since solar power will someday be a most important source of energy and presumably one which has little pollution potentialities.

I also regret to note that there is no discussion of the possible application of dry cooling towers which would save quantities of water--a matter of considerable merit in our arid Southwest.

E. A. Lundberg October 22, 1971

In the reports, I note that Peabody Coal claims that the removal of water for slurry, etc. from deep wells will not interfere with superficial sources of water utilized by natives and wildlife. If such information has been adequately studied I believe that such a report should be available to the public. I also notice that ground water studies are contemplated which implies to me that inadequate knowledge is available on this subject at the present time.

I believe it should be brought to your attention a public opinion survey in Utah, resulted in a majority of residents approval of the construction of the plants, however they also made it crystal clear that environmental controls must be adequate. If my comments are accurate it would seem that for the present, at least, adequate environmental controls are not adequate and that some delay or modification of construction of these plants is in order until the necessary studies by CPEAC of other organizations are completed.

I hope you will find these comments worthy of consideration.

Sincerely,

Harold B. Lamb

Harold B. Lamb M.D.
Legislative Chairman
Utah Audubon Society
1060 East First South #309
Salt Lake City, Utah 84102

HBL:ksb

New Mexico Citizens for Clean Air and Water

113 Monte Rey Drive No.
Los Alamos, N. M. 87544
October 28, 1971

D. L. Crandall
Regional Director
United States Department of the Interior
Bureau of Reclamation
Regional Office - Region 4
P. O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

Re: Huntington Canyon
Environmental Statement

I am forwarding comments addressed specifically to the Navajo Power Project Environmental Statement rather than Huntington. Since the environmental statements and problems at the sites are similar, I believe my thoughts are applicable to both. I recognize the proximity of the Grand Canyon and Lake Powell to Navajo makes that case probably the more critical.

Thank you for offering me this opportunity to present my views.

Very truly yours,

John R. Bartlit

John R. Bartlit, D. Eng.
State Chairman

JRB:nb

Attachments

NEW MEXICO CITIZENS FOR CLEAN AIR & WATER, INC.

113 Monte Rey Drive North
Los Alamos, New Mex. 87544
October 27, 1971

United States Department of the Interior
Bureau of Reclamation
Regional Office -- Region 3
P.O. Box 427
Boulder City, Nevada 89005

Re: 3-150/120.01 Navajo Project
Environmental Statement, Sept. 1971

Gentlemen:

Two statements contained in the environmental statement for the Navajo Project indicate very clearly to me that not enough is being done, i.e. not enough money is being spent, to protect the environment of the Southwest in providing energy for Phoenix and Los Angeles. My conclusion is based on a simple form of the industrially popular method of cost-benefit analysis.

In a region such as the Grand Canyon where any degradation is highly undesirable, the limiting criterion to be met should not be how much degradation can be tolerated, nor even what is the best available pollution control technology since more dollars will always buy better controls. Although we can ask how much electricity we need, it is not a practical question to ask do we need electricity or unspoiled recreational areas. At the Grand Canyon, I believe the determining question should be how much money can be spent on minimizing degradation and still provide energy, not at a minimum cost, but at the highest tolerable cost as judged by what the cost used to be and what other sections of the country manage to bear.

The first of the two statements appears on page 56 of the report--

> ....annual consumer costs of the Navajo Project...would be 6.95 mills/KWH....

If this really means consumer costs as it says, this is cheap electricity as compared to national average costs of electricity delivered to the consumer.* This implies to me that the cost of the electricity could be further increased without pricing it out of the market. Statements contained on pages 53-54 of the report indicate what benefits would accrue to the Southwest from increased expenditures on environmental controls at Navajo. Page 53,

> Wherever sulfur pollution is significant--which is wherever large amounts of coal and oil are burned--visibility diminishes as relative humidity rises.

and on page 54,

> TVA has called attention to a potential decrease in area visibility due to the interaction of SO_2 and NO_x with resultant formation of aerosols.

Clearly there will be degradation of our visibility. The report categorizes this as an unavoidable adverse environmental effect if the proposal is implemented. Here I disagree, at least in degree. I contend that still more money could be made available for controls and, despite industry's claims to the contrary, better controls could be purchased with this money to further minimize degradation. For example, the collecting area of electrostatic precipitators per unit volume of gas treated could be increased for more dollars and this would remove more particulate matter. Ninety-nine per cent effective bag filters could be added in series with the presently proposed controls--not instead of but in addition to them. From the industry's point of view this is not a good cost-benefit ratio decision to make because the additional tons of pollutant collected by such methods will cost more dollars per ton to collect than they are spending per ton collected with the presently proposed controls. However our air would be cleaner and the electricity would still be available and available at a price comparable to prices charged elsewhere in our nation for electricity.

A similar argument can be made regarding SO_2 control. Over 98% sulfur removal was achieved on commercial scale plants in England burning 0.9% S coal prior to World War II. There were problems of plugging and a cold, nonbuoyant plume. The plugging problem can be solved by recirculating more water, which requires more dollars, and the cold plume problem by reheating. The forward step in technology I am suggesting is a smaller step forward than was made in England back in the 1930's.

Because decisions in the United States are traditionally based primarily on economics, I would make one final economic argument in closing. I detect a tendency to reason that if we spend too much on environmental controls, we will spend ourselves "into the poorhouse". Although I am a chemical engineer and not an economist by training, let me offer the following: at a time when the administration in Washington is striving to spur capital investment by industry for the good of the economy, keep in mind that each dollar spent by power companies on environmental controls is a dollar earned by someone else in pollution control research, engineering, construction, and operation. Pollution control in the power industry--a regulated industry--is an ideal place to begin taking up the slack left by such depressed industries as the aerospace industry.

Very truly yours,

John R. Bartlit

John R. Bartlit, D. Eng.
State Chairman
New Mexico Citizens for Clean Air & Water

JRB:nb
cc: letter to Arizona Public Service Co. customers

* In 1968 the average price of electricity per KWH sold to ultimate customers was 15.5 mills. In 1962 the average production cost per KWH was 8.5 mills. (National Power Survey)

NEW MEXICO CITIZENS FOR CLEAN AIR & WATER, INC.

113 Monte Rey Drive No.
Los Alamos, N. M. 87544
August 26, 1971

An Open Letter to APS Customers:

Customers of Arizona Public Service Company recently received with their monthly electric bills a pamphlet by William Reilly, president of APS, telling his views on pollution and the environment as they relate to the electric power industry. I, one of the critics to whom he referred, do not disagree with very much of what Bill Reilly said in that pamphlet, but there was much left unsaid. Using what channels are available to citizens, I beg to tell his customers another side, an environmentalist's view, of the Four Corners air pollution story.

What is the problem?

Mr. Reilly recounted how, by the end of 1973, all four smokestacks at Four Corners will be "99.22% clean of fly ash." The need for critics was amply demonstrated at the 1969 New Mexico air pollution hearings at which the regulation was set requiring APS stacks to be 99.2% clean of fly ash. APS spent one full day at those hearings bringing in expert witnesses to testify that 99.2% control of ash was "infeasible" and that 97% (allowing nearly four times as much dirt) was the best attainable.

Even with 99.22% control of ash, however, one would be derelict if he failed to examine the emissions still to be remaining after 1973. The remaining emissions for the APS plant, together with some comparisons, are shown below:

	APS 4-Corners Plant after 1973	Union Carbide Plant at Marietta, Ohio	All Sources in Los Angeles County
particulates (ash), tons/day	38	22	110
sulfur dioxide (SO_2), tons/day	320	270	225
nitrogen dioxide (NO_2), tons/day	220	not known	950 (695 from auto

The Union Carbide plant, which has achieved so much notoriety for Marietta, Ohio, contributes half the particulates and nearly all of the SO_2 emitted into that heavily industrialized, problem air pollution basin. Each of these pollutants (particulates, SO_2 and NO_2) in sufficient quantity (and the Federal Environmental Protection Agency believes 110 tons of SO_2 per day is sufficient quantity) will cause health damage, and each pollutant in any quantity will degrade visibility in what was once a clean air region. This is why environmentalists are not satisfied with 99.2% control of ash.

What can be done?

Much better control of fly ash as well as control of the other pollutants is technically feasible. Plants in Germany having similar ash problems to Four Corners were achieving better than 99.7% emission control half a decade ago. Such control could bring about a threefold reduction of APS emissions -- 38 tons down to around 12 tons per day of particulates. Better still is done in other heavy industries. Special equipment is needed to collect the finest size particles, which are responsible for most of the health hazard as well as the loss of visibility.

Control of more than 95% of SO_2 emissions was achieved in England a quarter century ago. Nitrogen dioxide could be greatly reduced by proper boiler design.

What about cost?

Reilly listed the $32 million spent to date for pollution control at Four Corners, with $60 million more probably to be spent by '75. But again there is more that could be said by comparing these with total expenses and costs.

Thirty-two million dollars represents a small part (1/8th) of the capital investment ($250 million) for the Four Corners powerplant, which in turn accounts for a small percent (averaging 28%) of the total cost of providing electricity--the larger portion is operating (including fuel) and distribution costs. Thus expenditures to date for pollution control have represented only a couple percent of the delivered cost of electricity for APS.

What happens to 'progress' if the cost of energy goes up 20%?

A recent ad by a New Mexico utility company touted:

5¢ WORTH OF ELECTRICITY WILL: Operate a color TV for 5 hours!
Wash dishes from 40 meals! . . .

If energy costs went up 20%, 5 hours of color TV and dishwashing for 40 meals could still be bought for the bargain price of 6¢, with the added penny contributing directly to the creation of new research, engineering, and construction jobs in the pollution control industry. As Reilly pointed out in his pamphlet,"your unit cost for electricity averages less now than it did 20 years ago." In fact, it averages 20% less, which means we could go back to the unit cost of electricity that existed in 1950. Our standard of living in 1950 was hardly in the cave-man and wood-fire days so often darkly hinted at by industrialists. Furthermore, in 1962, for which I have data, energy costs varied throughout our nation from 50% less to 26% more than paid in the Southwest, with the highest costs being paid in the North Central Region--a region certainly not lacking in 'progress.'

If people want power, they must pay the costs. We cannot continue to hide part of the cost in remote reaches of New Mexico. Ultimately, of course, it seems inescapable that preparations must be started for living within a limited total power budget. The environment is truly a many-sided question. Thank you for listening to one critic's viewpoint.

Very truly yours,

John R. Bartlit
State Chairman, NMCCA&W

John R. Bartlit

UTAH POWER & LIGHT COMPANY
1407 WEST NORTH TEMPLE STREET
P. O. BOX 899
SALT LAKE CITY, UTAH 84110

January 7, 1972

Mr. Edward G. Bywater
Regional Property & Service Office
Region 4 Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84111

Subject: Environmental Statement for the Huntington Canyon Generation Station and Transmission Line

Dear Mr. Bywater:

The following comments are with reference to the Bureau of Mines letter of October 15, 1972. The letter required clarification or additional information on the following:

1. A summary history of Connellsville was provided by Mr. Jay Haymond, Preservation Historian, Division of State History, State of Utah:

"Connellsville was a community of about 3000 people located in Huntington Canyon, Emery County, Utah. It was established as a coal camp in 1874. The eleven or so mines there produced coal for about fifteen years, three or four of which the production was devoted to the coking process, the first in the west. The high quality coke, about 12 1/2 tons daily from ten beehive ovens made of brick produced in Connellsville, created sufficient demand to be partly responsible for construction of the Scofield and Pleasant Valley railroad running from Scofield to Springville, Utah County. The narrow guage was later sold to the Denver and Rio Grande Railroad Company and constitues the grade down Spanish Fork Canyon."

At the present time, mine entries, two wood buildings, an old timber tipple and three stone wall remnants of coke ovens, all in a badly deteriorated condition, are the only visual remans of the site of Connellsville. The two buildings and mine entries will be above the reservoir surface. However, the remnants of the coking ovens and tipple will be inundated.

January 7, 1972

Mr. Edward G. Bywater
Regional Property & Service Office
Region 4 Bureau of Reclamation

It is apparent that the site has not been visisted in the past to any extent by the general public. However, the reservoir will bring attention to the existence of this site and significant remnants can be preserved for the interest of the general public.

The relocation of the coke ovens to higher ground is possible. However, relocation of the decayed wood tipple appears impractical.

At the request of Dr. Haymond we are relocating the remnants of the coke ovens and providing suitable boat dock, protective facilities and plaque. Some camping facilities will also be incorporated at this site if satisfactory maintenance provisions can be worked out with the State Department of Natural Resources.

2. Earth used to cover ash will be taken from the area immediately adjacent to the ash disposal site. Soils vary in consistency from fine clay and silt to sandy gravel, with some rock. The material will be generally selected which will support growth of sage brush and grasses native to the area. However, specific preparation to remove rocks, for example, is not believed necessary or even desirable in order to achieve an eventual undisturbed appearance.

A detailed plan outlining specific locations and fill depths has not as yet been developed. However, such a plan will provide for placing ash in generally continuous deposition within a single "live" storage area. When it is practical for economic or other reasons to suspend placement for an extended period or to permanently abandon a specific storage area, this area will be considered as "dead" storage and covered with earth to prevent blow-away restore the natural appearance.

3. Flash flooding does occur in this deseret country. Diversion above the ash disposal area will be designed for a probable maximum flood in a 50 year period.

Yours very truly,

F. N. Davis, Manager
Engineering & Construction

FND/bc

Brigham Young University

October 12, 1971

Mr. D. L. Crandall
U.S. Dept. of the Interior
Bureau of Reclamation
Regional Office - Region 4
P.O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

This letter is in response to your request of September 30, 1971 for review and comments on the draft statement on the Huntington Canyon generating station and transmission line.

After careful review I feel that this environmental statement is fairly objective with a rather complete treatise of both adverse and beneficial effects covered. In relation to the Huntington Canyon project, I agree with the statement on page 3 of the draft.

> Where it is not practicable to reassess the basic course of action, it is still important that further incremental major actions be shaped so as to minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.

Before construction is started on units 2, 3 and 4, a complete evaluation of studies in progress on the effects of unit 1 should be made and any changes which appear necessary should be implemented before approval of any future construction.

One area of concern passed over lightly in this draft was the effects on Huntington Creek of sediments from the dam construction and road relocation. Sediments from construction of Electric Lake dam and relocation of the forest road will, as discussed on page 62, cause damage to the stream but there is no evidence that this damage will be temporary as stated. One important aspect of a good trout stream is deep holes. Sediments from construction tend to fill these holes, and there is no reason to believe that these holes will be cleaned out after construction has halted. Sediment also may destroy substrate interfaces necessary for the survival of many aquatic insects and other organisms which are important food sources for the fish species present in Huntington Creek.

Center for Environmental Studies, 395 BRMB, Brigham Young University, Provo, Utah 84601 (801) 374-1211, Ext. 2098

Mr. D. L. Crandall
October 12, 1971

In many instances, the damage from construction is permanent and can not be repaired.

On pages 43-45 it was stated that no water from the mine or power generating station will enter Huntington Creek; rather, the water will be treated and then recycled or evaporated. This is the ideal situation and care should be taken so that evaporation and holding ponds have adequate capacity so that periodic flushes aren't released into Huntington Creek.

Water quality criteria for Huntington Creek should be established so that Utah Power and Light Company and enforcement agencies will know what limits are allowed for various water quality parameters. Studies being conducted by the Center for Environmental Studies at Brigham Young University should be of considerable value in completing this classification of Huntington Creek.

I appreciate the opportunity to review this environmental statement and would appreciate receiving any materials related to environmental studies or impact of the Huntington Canyon generating station or reservoir which you might receive.

Sincerely,

Robert N. Winget

Robert N. Winget, Ph.D
Research Associate

RNW:tm

UTAH | COLORADO

ARIZONA | NEW MEXICO

FOUR CORNERS REGIONAL COMMISSION
SUITE 238 - PETROLEUM PLAZA BUILDING
3535 EAST 30TH STREET
FARMINGTON, NEW MEXICO 87401
AREA CODE 505-327-9628

OFFICE OF THE EXECUTIVE DIRECTOR

October 27, 1971

Mr. D. L. Crandall
Regional Director
U. S. Dept. of the Interior
Bureau of Reclamation
Regional Office - Region 4
P. O. Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

Thank you for the opportunity to review the Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line.

Our staff has reviewed the statement and finds nothing in the contents which might be in opposition to the objectives of the Four Corners Regional Commission.

Sincerely,

Allan T. Howe

Allan T. Howe
Executive Director

PEABODY COAL COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
301 NORTH MEMORIAL DRIVE · ST. LOUIS, MISSOURI 63102
TELEPHONE (314) 436-3400

October 13, 1971

Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84111

RE: Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line
September 17, 1971

Gentlemen:

Thank you for the opportunity of reviewing the above draft statement.

As a general comment Peabody believes that the government should specifically endorse all of the comments which are attributed to the Utah Power and Light Company throughout the draft statement. On pages 3, 5, 10 and 35, for example, the statement includes the comments of the Company or its consultants, as though they are independent of the agency's conclusions. Inasmuch as the Act calls for the lead agency of the government concerned with the project to make the report it would seem appropriate for the government to say in such cases that it embraces the conclusions of the Company. For example, on page 3, in the middle paragraph, it would seem appropriate for the first sentence to read as follows:

> "As of January 1, 1970 years of investigation have been completed and actions taken so that neither the Company nor the government considers it practical to reassess the basic course of action relative to the first unit of the Huntington Canyon Generating Station."

The next sentence in that paragraph does refer to the Company and the government together.

On page 64 the title "Environmental Impact Effects" appears to refer to the requirements of 102(2)(c)(ii) which calls for a recitation of the

"Adverse Environmental Effects which Cannot be Avoided." In addition to making the title more descriptive of the material to be covered, the text should likewise deal with adverse effects which cannot be avoided. For example, material on page 64 points out that the Company will comply with all appropriate federal, State and local rules and regulations. It does not discuss adverse environmental effects which cannot be avoided. On the other hand, the section starting on page 35 and ending on page 63, entitled "Impact on the Environment", enumerates the several impacts which the project will have on the environment, and then proceeds to discuss the adverse aspects of that impact which cannot be avoided. In the interest of clarity it would seem appropriate to either separate the material under this heading into the two categories required by Section 102 (2)(c)(i) and (ii), or to consolidate the response under a heading which reads "Impact on the Environment, Including Adverse Environmental Effects which Cannot be Avoided." The material seems to be there, but it is not as clearly set forth as it might be.

On page 64 the statement specifically disclaims the applicability of expert opinions concerning the pollution levels on human health or vegetation. The paragraph goes on to elaborate why the national studies may not be relevant to the local problem. It seems, therefore, that the entire section should be removed, or at best attached as an exhibit to the statement merely to indicate that the Company and the government are both keenly aware of the current status of research regarding the harmful effects of pollutants on human health and vegetation. Leaving this material in the report where it is suggests a relevance and a certainty beyond that which apparently was intended.

On page 10, the last full paragraph, the second and third sentences should be replaced by the following more accurate statement:

> "The mine is located on lands owned or leased by the Company within the boundaries of the Manti-La Sal National Forest".

Very truly yours,

James H. Krieger, Consultant
to Peabody Coal Company

PEABODY COAL COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
301 NORTH MEMORIAL DRIVE · ST. LOUIS, MISSOURI 63102
TELEPHONE (314) 436-3400

January 14, 1972

Mr. J. W. Mullan, Vice Pres.
Government Relations
National Coal Association
1130 Seventeenth St., N.W.
Washington, D. C. 20036

Dear Joe:

In response to your question concerning the coal we propose to ship to the Huntington Canyon Plant, enclosed you will find an analysis of our Blind Canyon seam coal.

You will note that our calcium content averages in excess of 8%. Also on the plus side you will note that the sodium averages close to 5%. Both of these are excellent grabbers.

If a wet scrubbing system, much the same as presently is in operation at Minnesota Power & Light, is installed using recirculated water, I am sure they should find an excellent reduction in SO_2 emissions.

Yours very truly,

Thomas G. Healy
Air Quality Engineer

TGH/ds
Enclosure
CC: Mr. J. J. Ellis

PEABODY COAL COMPANY
SUBSIDIARY OF KENNECOTT COPPER CORPORATION
301 NORTH MEMORIAL DRIVE · ST. LOUIS, MISSOURI 63102
TELEPHONE (314) 436-3400

October 22, 1971

Re: Castle Valley Mining Company
Deer Creek Mine
Blind Canyon Seam Coal

The following is an average analysis of the current production from the prospect mine near Orangeville, Utah.

	As Received	Dry
Moisture	7.00	-
Ash	6.16	6.62
Volatile	40.92	44.00
Fixed Carbon	45.92	49.38
Btu	12800	13763
Sulfur	.43	.46

FUSIONS	Reducing	Oxidizing
Initial Deformation	2100	2230
Softening (H=W)	2240	2330
Softening (H=½W)	2380	2430
Fluid	2520	2535

Mineral Analysis of Ash

Phos. pentoxide, P_2O_5	.32
Silica, SiO_2	53.53
Ferric oxide, Fe_2O_3	5.39
Alumina, Al_2O_3	19.43
Titania, TiO_2	1.11
Lime, CaO	8.25
Magnesia, MgO	.87
Sulfur trioxide, SO_3	5.25
Potassium oxide, K_2O	.46
Sodium oxide, Na_2O	4.80
Undetermined	.59
Grindability	46.4

Jack J. Ellis
Director
Customer Technical Services

JJE/dg

JOHN M. HERBERT
1323 THIRTY-FIRST STREET
OGDEN, UTAH 84403

Nov. 1, 1971

Regional Director
Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Ut.,84111

Dear Mr. Crandall:

This concerns the Draft of Environmental Statement, Huntington Canyon Generating Station and Transmission Line".

The draft appers to be complete and well written. It evaluates the various impacts of the project in terms which I would expect to see used by a public relations man for the power company - not by gov't agencies charged with looking out for the public interest. The language used on pages 84 and 85 illustrates this point. Adverse effects are qualified and minimized whereas benefits are stated in positive terms. On what basis do you state long term enhancement of recreation should occur? Apparently someone thinks the power line and structures, plus the fouled air and reduced visibility is more than offset by the small impoundment and improved road. In my opinion this is strictly company type reasoning for public relations purposes. Do the gov't agencies really think the power line has no adverse effect on scenic beauty? Do they believe that the dumping of tons of SO_2 and other pollutants in the "public domain" atmosphere will not seriously detract from the quality of life for those who have to live nearby or those who use Huntington Canyon for recreation? If, as stated, and enunciated in recent company news releases, there will be no problem in complying with Federal ambient air quality standards, why is provision being made to install SO_2 recovery equipment in the event the industry eventually gets around to developing it? This too, looks like public relations.

I would urge that to the extent the gov't has jurisdiction, it defer operation of the plant until the new pollutant control equipment discussed in the report is available.

The report is silent on the question as to ownership of the coal. If a BLM lease is involved, might this not provide a means of gaining some needed control.

Sincerely,

John M. Herbert

United States Department of the Interior
Bureau of Reclamation

October 26, 1971

Gentlemen:

I wish to comment on the Draft Environmental Statement, Huntington Canyon Generating Station and Transmission Line, September 17, 1971, even though as a layman, unfamiliar with the area in question, I am not qualified to question the research that has been done or is being done.

According to the Statement, Utah Power and Light Company "is constructing a thermal-electric generating station....", so I must assume that construction is underway and will be completed regardless of any opposition. The environmental statement, therefor, comes somewhat late, which is understandable only if the construction was begun before the existence of the Environmental Protection Agency and its requirements.

The Statement is extensive and impressive, yet I have some doubts about the environmental impact which will be permitted as a necessary and economically justifiable minimum.

The Statement, p. 22, cites 8 possible sources of environmental impact which "may arise", in spite, I assume, of all precautions. Some damage is expected to fish, wildlife habitat, vegetation, Huntington Creek, e.g. : "Purchase and improvement of other lands are not true replacement of [wildlife] habitat." "Water development nearly always detracts from and seldom adds to stream fishing resources." "Utah is increasingly jealous of its remaining streams and tries to prevent unreasonable loss from any type of development." "Although an attractive body of water when filled, its [Electric Lake] deep, steep-sided shape will not encourage a high biological response."

There seems to me to be an implied assumption in the Statement that all such environmental impacts are acceptable, but I do not think this has been proven.

I am concerned about deterioration of air quality in the region, whether or not the ambient air standards of Utah are met. I understand that the most recent guidelines for implementation of the 1970 Clean Air Act Amendments no longer contain the requirement that primary and secondary standards "shall not be considered in any manner to allow significant deterioration of existing air quality in any portion of any state". This is unfortunate, and causes me even greater concern. Deterioration of air quality in the region cannot be avoided if 0.9 - 1.4 tons of fly ash, 33 - 45 tons of SO2 and sundry amounts of SO3, NOX, mercury, radionuclides etc. are emitted each day. I do not believe that state/federal standards for particulates and SO2 are adequate to protect presently clean air in the state, at least not the primary standards. In the frequently smoggy Salt Lake Valley , the readings for SO2 on such days are more often than not below the standard. Our particulate standard is close to the annual average of particulates in the valley air for recent years. The 0.5 % of particulates which will not be removed from the Huntington stacks will be in the form of fine ash, which is considered to be one of the greatest factors in reduction of visibility. It seems obvious that the air will deteriorate, though opinions will certainly vary as to whether or not the deterioration is significant. I believe it is significant for its own sake, and because of the precedent it sets for acceptance of further "minor" deteriorations.

I am concerned, too, about the short lifespan of the plant as the coal supply runs out. What will be done to remove the buildings, transmission lines etc.? What will happen to the reservoir? Will the plant be worth the damage in the long run?

Since I consider it inevitable that Huntington will be built, I can only say that I support all efforts to minimize the environmental impact. However, I most solemnly request that any further power plants in Utah - or anywhere - be contracted for and built after,not before , the fact of the environmental impact statements. I believe that instead of this rather frantic effort to develope coal-fired power plants all over the West, our monies should be going into accelerated research into alternate power sources. I understand that the U.S. Bureau of Mines has succeeded in converting organic refuse into low sulfur oil. I have long thought that Man will ultimately have to learn how to use organic wastes for fuel, speeding up by magnitudes the geological processes which first created coal, oil, gas. When we do this, we will have an ever-renewable fuel source. If some day - why not now?

Most sincerely,

Joanne Torosian

Mrs. Edward Torosian
3675 South 2210 East
Salt Lake City, Utah 84109

REFERENCES

1/ "Control Techniques for Sulfur Oxide Air Pollutants," DHEW, PHS - January 1969

2/ "Control Techniques for Particulate Air Pollutants," DHEW - January 1969

3/ Monthly Progress Report, "A Study and Review of Vegetation, Ecological Conditions, and Air Quality at the Huntington Canyon Powerplant Location," - Utah Power & Light Company - Prepared by Utah Engineering Experiment Station, Center for Environmental Studies, University of Utah - February 1971

4/ Environmental Analysis Report - Utah Power & Light Company - Deer Creek Coal Mine and Coal Transportation System, Huntington-Fairview Forest Highway #7 Relocation, Electric Lake Dam and Reservoir - Department of Agriculture, Forest Service - April 27, 1971

5/ "Environmental Quality," The First Annual Report of the Council on Environmental Quality - Transmitted to the Congress - August 1970

6/ "Air Quality Criteria for Sulfur Oxides," U. S. Department of Health, Education, and Welfare - January 1969

7/ As quoted by K. W. Nelson in the transcript of the public hearing before the Utah Air Conservation Committee and Utah State Board of Health on proposed air quality standards and regulations on sulfur dioxide and visible emissions, Salt Lake City, Utah - January 9, 1970

8/ "Air Quality Criteria for Particulate Matter," DHEW, PHS - January 1969

9/ Report Number 706-A - North American Weather Consultants - "A Meteorological Evaluation of Dispersion of Stack Effluent From the Proposed Powerplant in Huntington Canyon, Emery County, Utah - Vol. 1" April 1971

10/ Joint Meteorological Report - Prepared for Navajo Project, Mohave Project, San Juan Project, Four Corners Project, Huntington Canyon Project - Contributors: Dames & Moore, North American Weather Consultants, Loren W. Crow, Consulting Meteorologist; Dr. Robert G. Larsen, University of Utah; Dr. Clyde Hill, University of Utah - September 1, 1971

11/ "Statistical Abstract of the U. S. Department of Commerce, Bureau of the Census" - 1970

12/ "Contribution of Fly Ash to Light Scattering and Visibility in the Vicinity of the Huntington Plant, Utah Power & Light Company," Utah Engineering Experiment Station, February 29, 1972

13/ Annual Report for period January 1 to December 31, 1971, "Aquatic Environmental Impact Study of Huntington Canyon Generating Station and Electric Lake," Center for Environmental Studies, Brigham Young University

14/ Appendix E, Southwest Energy Study Report of the Meteorology Work Group, Draft Report, March 1972, prepared by National Oceanic and Atmospheric Administration

APPENDIX

A-42 Addendum to Report #706-A, "A Meteorological Evaluation of Dispersion of Stack Effluent From The Proposed Powerplant in Huntington Canyon, Emery County, Utah"

A-46 Comments on Item 4 of the Letter From the Environmental Protection Agency to the Secretary of the Interior - April 10, 1972

A-48 Ash Disposal Area Plan & Profile (Utah Power & Light Company)

A-49 Evaporation Basin Proposed Dam Section (Utah Power & Light Company)

A-50 Grading Plan - Settling Basin Area (Utah Power & Light Company)

A-51 Sections and Details - Settling Basin (Utah Power & Light Company)

A-52 TVA Comments - Appendix E of the Southwest Energy Study


SALT LAKE CITY
CAMP WILLIAMS
PROVO
SALT LAKE CO
UTAH CO
TOOELE CO
40 MILES
GOSHEN
UTAH CO
JUAB CO
NEPHI
60 MILES
SANPETE CO
JUAB CO
MOUNT PLEASANT
EMERY CO
SANPETE CO
CARBON CO
EMERY CO
HUNTINGTON
57 MILES
GREEN RIVER
45 MILES
GRAND CO
EMERY CO
GRAND CO
SAN JUAN CO
GREAT SALT LAKE
SALT LAKE

LEGEND

- PROPOSED 345 KV LINE
- TERMINAL-SIGURD 230 KV LINE
- INDIAN RESERVATION LANDS
- COUNTY LINES
- FOREST LAND

MOAB

56 MILES

MONTICELLO

MONTEZUMA CO. COLORADO

SAN JUAN CO. UTAH

47 MILES

BLANDING

25 MILES

27 MILES

SAN JUAN STA.

FOUR CORNERS STA.

SHIPROCK STA.

NAVAJO INDIAN RESERVATION

UTAH POWER & LIGHT COMPANY

CAMP WILLIAMS – FOUR CORNERS

345 KV LINE

NO SCALE — OCT. 1969

A-1

LIST OF MAMMALS OCCURRING IN HUNTINGTON CANYON HEADWATERS

Dusky shrew	Sorex obscurus
Water shrew	Sorex palustris
Big myotis	Myotis lucifugus
Hairy-winged myotis	Myotis volans
Snowshoe rabbit	Lepus americanus
White-tailed jack rabbit	Lepus townsendii
Red squirrel (Chickaree)	Tamiasciurus hudsonicus
Yellow-bellied marmot	Marmota flaviventer
Uinta ground squirrel	Citellus armatus
Rock squirrel	Citellus variegatus
Golden-mantled ground squirrel	Citellus lateralis
Least chipmunk	Eutamias minimus
Cliff chipmunk	Eutamia dorsalis
Say chipmunk	Eutamias quadrivittatus
Northern flying squirrel	Glaucomys sabrinus
Northern pocket gopher	Thomomys talpoides
Botta pocket gopher	Thomomys bottae
Beaver	Castor canadensis
Deer mouse	Peromyscus maniculatus
Brush mouse	Peromyscus boylii
Bushy-tailed wood rat	Neotoma cinerea
Red-backed mouse	Clethrionomys gapperi
Muskrat	Ondatra zibethicus
Pennsylvanian meadow mouse	Microtus pennsylvanicus

LIST OF MAMMALS OCCURRING IN HUNTINGTON CANYON HEADWATERS (Cont'd.)

Montane meadow mouse	Microtus montanus
Long-tailed meadow mouse	Microtus longicaudus
Big jumping mouse	Zapus princeps
Porcupine	Erethizon dorsatum
Coyote	Canis latrans
Black bear	Ursus americanus
Long-tailed weasel	Mustela frenata
Mink	Mustela vison
Marten	Martes caurina
Badger	Taxidea taxus
Bobcat	Lynx rufus
Mountain lion	Felis concolor
Wapiti (Elk)	Cervus canadensis
Mule deer	Odocoileus hemionus
Striped skunk	Mephitis mephitis

FISHES OF THE HEADWATERS OF HUNTINGTON CANYON

Cutthroat trout	Salmo clarki
Brown trout	Salmo trutta
Rainbow trout	Salmo gairdneri
Brook trout	Salvelinus fontinalis
Speckled dace	Rhinichthys osculus
Mountain sucker	Catostomus platyrhynchus
Mottled sculpin	Cottus bairdi

HUNTINGTON PLANT FUEL

1-13-71
JCC/s

The average fuel characteristics are expected to be as follows:

Bituminous Coal	Hiawatha Seam	Blind Canyon Seam
Grindability, Hardgrove	46	46
Proximate Analysis: (As Received)		
Size, Inches Max.	1-5/8X0	1-5/8X0
Moisture, %	6.43	6.04
Volatile Matter, %	40.67	42.00
Fixed Carbon, %	42.88	44.88
Ash, %	9.43	6.62
Sulfur, %	.59	.46
Total, %	100.00	100.00
B.t.u./lb.	12,192	12,944
Ash Fusion Temperatures (Reducing):		
Initial Deformation, ^{o}F	2,250	1,950
Soft, ^{o}F	2,310	1,990
Fluid, ^{o}F	2,460	2,050
Ultimate Analysis:		
Moisture, %	6.43	6.04
Carbon, %	68.30	70.61
Hydrogen, %	4.91	5.40
Nitrogen, %	.81	1.23
Oxygen, %	10.18	10.07
Sulfur, %	.55	.43
Ash, %	8.82	6.22
Total	100.00	100.00
Chemical Analysis of Ash:		
P_2O_5	.88	.32
SiO_2	51.62	53.53
Fe_2O_3	4.73	5.39
Al_2O_3	22.30	19.43
TiO_2	1.24	1.11
CaO	7.80	8.25
MgO	.67	.87
SO_3	5.21	5.25
K_2O	.34	.46
Na_2O	4.46	4.80
Und.	.75	.59

MODELING INPUT FURNISHED TVA FOR MODELING STUDIES

HUNTINGTON CANYON GENERATING STATION

1. Number of stacks - Now 1 stack, eventually 4 stacks, 4 units
2. Number of units per stack - 1 unit per stack
3. Inside diameter at top of stack - 20-25 feet approximate
4. Stack height - 400-600 feet
5. Stack spacing - 350'-400'-350' (4 stacks between each stack endline)
6. Stack alinement - 45°W of N
7. Stack gas temperature - 254° F.
8. Stack gas velocity - 80 fps
9. Unit size - 400 (nominally), 427.8 megawatts net. 2,000 megawatts. Two 400 (first). Two 600 (last).
10. Number of units - 1 committing, up to 4 possible
11. Coal burn per unit -

    Blind Canyon - 3,840 tons per day - 12,944 B.t.u. per pound
    Hiawatha Canyon - 4,068 tons per day - 12,192 B.t.u. per pound

12. Per cent excess air - 21 per cent combustion zone, 26 per cent overall
13. Coal analysis -

	Hiawatha Canyon	Blind Canyon	Range
	Per cent		
Moisture	6.43	6.04	4.0-9.0
Carbon	68.30	70.61	
Hydrogen	4.91	5.40	
Nitrogen	0.81	1.23	
Oxygen	10.18	10.07	
Sulfur	0.55	0.43	0.32-0.80
Ash	8.82	6.22	5.0-11.0
	100.00	100.00	

14. Suggested ambient temperature (annual average 50-53° F. at Navajo)
15. SO_2 scrubbers - not yet committed
16. Optimum mixing depth - 2,500 feet
17. Critical wind speed - 8-28 fps, 5-18 mph

(Excerpt from Monthly Progress Report, February 1971 - "A Study and Review of Vegetation, Ecological Conditions, and Air Quality at the Huntington Canyon Powerplant Location," Utah Power & Light Company, Prepared by Utah Engineering Experiment Station - Center for Environmental Studies - University of Utah)

METHODS AND SAMPLING CONDITIONS

On February 1, 1971, the filter sampler at the Harrison Station was moved to the Shirl MacArthur residence, one door east of the LDS chapel on Second North Street in Huntington. This will give us three stations in Huntington.

Chemical analysis for SO_2 and $NO + NO_2$, using the methods described in the October report, were made December 14-17, 1970. These dates were chosen because a high pressure and stable air situation associated with inversion conditions had existed for a few days.

Dust fall jar, glass fiber filter, ozone, nephelometer, Beckman 906 SO_2, and Andersen sampler data for November, December, January, and February were processed.

The mobile lab was operated at various sites in Huntington on December 2, 3, 4, and 15, 1970. An attempt was made to maneuver downwind from local sources of pollution (churches, schools, and homes). The trailer unit was operated at the Litster residence for the remainder of the time.

RESULTS AND DISCUSSION

Sulfur Dioxide

Levels of SO_2 in Huntington were very low. Levels measured downwind from schools and churches gave only trace amounts except for some short-term peaks up to 2.5 pphm, as shown in Table 1. Routine operation of the Beckman 906 SO_2 analyzer at the Litster station gave zero readings or occasionally trace amounts (0.5 pphm) for all times measured except the days and peak concentrations presented in Table 2. Table 3 presents chemical analysis data. The peak levels measured are usually of short duration. The maximum measured in the winter was 8.0 pphm on December 14, but a 9-hour average for the period was 0.72 pphm (see Tables 2 and 3). The most stringent Federal standard (secondary) proposed by the Environmental Protection Agency (EPA) would allow a 24-hour average of 9 pphm. The peaks measured this past winter in Huntington were below this level. The 2 pphm standard for the annual average (arithmetic mean) is also well above the average SO_2 concentrations measured in Huntington.

Oxides of Nitrogen

A chemical analysis of the oxides of nitrogen (NO and NO_2) is presented in Table 3. The average level of SO_2 for the corresponding period is also shown. The ratio of NO + NO_2 to SO_2 was 2.0. Using the peak value of SO_2 concentration of 8 pphm, the highest expected NO + NO_2 value would be 16 pphm which is well below the 50 pphm required to cause damage to sensitive plants when exposed for several hours. The Federal standard proposed for a 24-hour average is 12.5 pphm. The maximum daily average expected for the oxides of nitrogen would be less than 1.5 pphm measured as a 9-hour average (Table 3) when the SO_2 was maximal.

Particulates

Suspended particulate matter concentrations in $\mu g/m^3$ are presented in Tables 4 through 13. Tables 4 and 5 summarize the data. Comparison of the stations shows that, with one exception, the Rowley station in Huntington had the highest average for a particular month, and the highest overall average. The Litster station was slightly higher in January, similar for December, and somewhat lower in February. The Litster station is near the church and schools and is in an area of greater activity. One of the roads adjacent to the Rowley home is unsurfaced. The high monthly averages for January at these two stations were associated with consistently high daily levels. Since winds were moderate, the levels were probably due to increased home heating. In February, the first two weeks were very windy, and on February 10, a very strong wind resulted in peaks of 416.5, 261.8, and 279.9 $\mu g/m^3$ for the Rowley, Litster, and MacArthur stations, respectively. The Litster and MacArthur stations were about the same for February.

The Utah State Division of Health code for particulates states: "In the State of Utah, the concentration of total suspended particulate matter in ambient air shall not exceed an annual geometric mean of 90 micrograms per cubic meter of air, with the further limitation that not more than 1% of the samples collected between April 1, and October 31, nor more than 5% of the samples collected between November 1, and March 31, shall exceed a concentration of 200 micrograms per cubic meter of air." Our data are presented as an arithmetic mean or average. Generally, the geometric mean, calculated by the State Division of Health by use of a computer, is 15% less than the arithmetic mean. Since the average particulate concentrations measured in Huntington would be expected to range from about 59 to 65 $\mu g/m^3$ (geometric mean), the values are less than the state standard. Daily concentration of 200 $\mu g/m^3$ set by the State has been exceeded to the extent shown in Table 5. The State limit was exceeded at the Harrison Station on 2.6 and 0% of the days for August-October and November-January, respectively. This station, however, met the State standard for the remainder of the sampling period and on the average was one of the lowest. This points out the contribution of local activity on the days this concentration was exceeded.

The most stringent proposed Federal Standard is 60 $\mu g/m^3$ for an annual geometric mean, and a limit of one day in excess of 150 $\mu g/m^3$. The Bear Creek station met these standards so far, and the Litster station is marginal.

Visibility data, as measured by the nephelometer for the Litster station near the school, are presented in Tables 14 and 15. Diurnal curves for January and February are shown in Figure 1. Improved visibility during the daytime may be associated with less home heating, decreased humidity, and a decrease in inversions. The low visibility at eight and nine o'clock in the morning may be associated with morning heating.

The size range distribution of particulates on a basis of weight and percentage are presented in Tables 16-19. Percentages of large particles (greater than 5 microns) were 41.7 for the Harrison station in November and 66.5 and 62.0 at the Litster station in December and February, respectively. The greatest proportion measured in the size fraction less than 1 micron was 28.5% at the Litster station in February.

Dust fall data are presented in Tables 20 and 21. Dust fall in Huntington and Castle Dale was generally higher than in the canyon areas except for the Bear Creek station which would be influenced by dust from the coal trucks traveling on the road several hundred feet below.

Ozone (O_3)

Results of Mast ozone monitoring are presented in Tables 22-24. Diurnal curves are presented in Figures 2 and 3. A high peak (10.1 pphm) lasting 3 to 4 hours was measured at the Litster station in Huntington on November 14 and 15. This appeared to be a local situation since no other reading above 4.2 pphm was noted at the Harrison station during November. The Federal standard is set at 6 pphm for an hour average. The September and October diurnal curves are more flattened out over the course of the day. The winter-time peaks are about the same as earlier in the Fall, but the daily average is generally lower.

TABLE 1

MOBILE SAMPLING IN HUNTINGTON

(1970)

SO_2 Measurements with 906 Analyzer Downwind from Schools and Churches

Date	Time	Location	Concentration (pphm) Peak	Average
12-2	930-1100	300 ft. SW of School	0	0
	1130-1300	300 ft. N of School	0	0
12-3	1045-1230	600 ft. NW of LDS Church	2.5	0.5
	1300-1430	600 ft. N of LDS Church	trace	< 0.5
12-4	915-1100	1st N and 1st E	1.0	0.8
12-15	1000-1300	600 ft. N of LDS Church	trace	< 0.5

TABLE 2

SULFUR DIOXIDE MEASURED AT LITSTER STATION WITH THE 906 ANALYZER

(Peaks and Daily Averages for Days that Significant Concentrations were Measured)

Date	Time	Peak Concentration (pphm)	Daily Average (pphm)
12-14-70	2300-2330	8.0	---
12-15-70	0030-0130	5.0	.06
1-25-71	1800-1900	1.5	.8
1-26-71	1400-1415	2.5	1.0
1-27-71	0100-0230	1.5	.06
The other 88 days		0	0

TABLE 3

CONCENTRATIONS OF SULFUR DIOXIDE AND THE OXIDES OF NITROGEN DETERMINED BY WEST AND GAEKE SO_2 ANALYSIS AND SALTZMAN NO_x ANALYSIS (HUNTINGTON)

(1970)

December Date	Time	Station	Pollutant Concentration (pphm) SO_2	Pollutant Concentration (pphm) $NO + NO_2$
14 to 15	2235-0735	Litster	0.72	1.47
16 to 17	1600-0845	Rowley	0.05	-

TABLE 4

SUMMARY OF MONTHLY AVERAGE PARTICULATE CONCENTRATIONS ($\mu g/m^3$)

Month	Harrison	Rowley	Litster	MacArthur	Bear Creek
Aug.	24.9	76.5	-	-	11.9
Sept.	71.5	92.8	-	-	16.6
Oct.	17.3	75.7	-	-	9.0
Nov.	25.2	75.2	-	-	10.6
Dec.	25.1	51.9	46.4	-	-
Jan.	24.2	98.0	103.0	-	-
Feb.	-	93.1	74.7	73.8	-

TABLE 5

SUMMARY OF PARTICULATE CONCENTRATIONS

Covered	Station	Number of Daily Samples	Arithmetic Mean ($\mu g/m^3$)	Days in Excess of 150 $\mu g/m^3$	Days in Excess of 200 $\mu g/m^3$
Aug. - Nov.	Bear Creek	94	11.8	0	0
Aug. - Jan.	Harrison	153	30.9	4	2
Aug. - Feb.	Rowley	186	76.1	5	2
Dec. - Feb.	Litster	74	69.3	1	1
Feb.	MacArthur	27	73.8	1	1

TABLE 14

VISIBILITY IN MILES FROM NEPHELOMETER DATA
LITSTER STATION - HUNTINGTON

(1970)

Daily Averages, Minimum Hour Average and Minimum Visibility

	NOVEMBER			DECEMBER		
Day	Daily Average	Minimum Hour	Minimum	Daily Average	Minimum Hour	Minimum
1				83	76	15
2				80	76	25
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13	89	75	17			
14	88	81	81	82	66	
15	97	69	16	78	59	21
16	85	72	1	92	59	13
17	78	69	1			
18	82	69	1			
19	84	69	25			
20	82	72	25			
21	82	69	1			
22	81	62	25			
23	83	62	23	96	74	14
24	80	72	16	75	59	25
25	78	62	42	77	59	16
26	82	76	42	86	59	16
27	80	69	33	82	33	29
28	78	62	16	81	59	23
29	72	66	33	81	49	16
30	82	76	33	90	59	25
31				84	59	16

TABLE 15

VISIBILITY IN MILES FROM NEPHELOMETER DATA
LITSTER STATION - HUNTINGTON

(1971)

Daily Averages, Minimum Hour Average and Minimum Visibility

	JANUARY			FEBRUARY		
Day	Daily Average	Minimum Hour	Minimum	Daily Average	Minimum Hour	Minimum
1				67.2	25	1
2				80.0	44	16
3				91.2	52	21
4				66.6	34	0.3
5				89.8	52	0.8
6				93.2	67	27
7				86.4	30	1
8				79.8	42	1
9				73.2	49	1
10				72.8	37	1
11				74.2	42	7
12				75.8	30	
13				73.0	30	1
14				65.6	30	1
15	33.6	21	1	63.4	20	1
16	44.2	16	1	71.6	30	0.5
17	51.8	17	1	65.0	49	23
18	54.2	18	1	70.4	33	1
19	65.4	33	1	65.0	37	1
20	46.8	25	1	86.0	42	27
21	67.6	33	1	59.4	30	7
22	93.4	49	1	63.2	30	1
23	64.0	27	1	58.8	30	12
24	74.2	30	1	51.2	20	1
25	69.2	23	0.7	74.6	30	1
26	63.2	34	1	76.0	30	16
27	56.8	18	0.8			
28	64.6	34	1			
29	52.6	17	0.7			
30	67.2	34	1			
31	75.4	44	0.6			

TABLE 16

HARRISON STATION - ANDERSEN SAMPLER

(1970)

Percentage by Weight of Total Particulates In Different Particle Size Ranges

Date	Size Distribution (μ)					
	8.4-15+	5-10.4	3-6.1	1.8-3.5	1.2-2.2	1.2-0.6
11-1 to 11-8	26.6	19.2	16.0	14.0	12.7	11.5
11-8 to 11-16	25.0	20.5	17.1	11.7	11.7	14.0
11-16 to 11-23	6.8	20.5	21.0	10.7	18.0	23.0
11-23 to 11-30	28.6	14.5	22.6	14.1	15.2	5.0
Average	23.2	18.5	18.7	12.9	14.1	12.5

TABLE 17

LITSTER STATION - ANDERSEN SAMPLER

Weight of Particulates in Different Particle Size Ranges ($\mu g/m^3$)

Date	Size Distribution (μ) 8.4-15+	5-10.4	3-6.1	1.8-3.5	1.2-2.2	1.2-0.6	<1.0
Dec. 1970 23 to 30	7.81	1.72	1.72	0.94	1.80	4.30	12.73
Jan. 1971 23 to 30	-*	30.1*	9.2	6.8	5.1	2.4	16.9
Feb. 1971 1 to 8	26.9	5.0	1.3	2.1	0.1	2.8	9.4
8 to 15	38.2	6.2	4.0	3.5	1.9	0.5	13.2
16 to 23	18.5	5.6	1.1	0.5	1.2	0.1	21.1
Feb. Average	27.9	5.9	2.1	2.0	1.1	1.1	14.4

* No filter on first stage. All the particles above 5 microns were collected on the second stage resulting in its having a high reading.

TABLE 18

LITSTER STATION - ANDERSEN SAMPLER

(1970)

Percentage by Weight of Total Particulates In Different Particle Size Ranges

Date	Size Distribution (μ)					
	8.4-15+	5-10.4	3-6.1	1.8-3.5	1-2.2	1.2-0.6
12-2 to 12-9	64.7	11.4	7.8	8.1	7.2	0.7
12-9 to 12-16	43.5	15.3	13.4	11.0	9.4	7.4
12-16 to 12-23	43.5	19.0	13.7	12.2	0	11.4
12-23 to 12-30	25.2	5.5	5.5	3.0	5.8	13.9
Average	51.7	14.8	11.3	10.2	6.1	5.9

TABLE 19

LITSTER STATION - ANDERSEN SAMPLER

(1971)

Percentage by Weight of Total Particulates
in Different Size Ranges

Date	Size Distribution (μ)						
	8.4-15+	5-10.4	3-6.1	1.8-3.5	1-2.2	1.2-0.6	<1.0
1-16 to 1-23	60.3	19.3	2.9	6.8	8.2	2.5	-
1-23 to 1-30	-	43.4	12.9	9.6	7.1	3.3	23.7
2-1 to 2-8	56.7	10.5	2.8	4.4	0.2	5.8	19.9
2-8 to 2-15	53.5	8.8	5.5	5.1	2.7	0.7	18.5
2-16 to 2-23	38.6	11.6	2.2	1.0	2.4	0.2	43.9
Feb. Average	51.2	10.8	3.9	3.7	2.0	2.0	26.5

TABLE 22

Ozone (O_3) Concentrations (pphm)*

HARRISON LOCATION

Daily Averages and High Hour Readings

	NOVEMBER	
Day	Daily Average	High Hour
1	2.7	3.6
2	3.0	3.5
3	3.2	3.9
4	3.1	4.0
5	2.5	3.5
6	2.3	3.5
7	2.7	3.6
8	3.4	3.6
9	2.7	3.3
10	2.1	3.3
11	2.5	3.1
12	2.6	3.3
13	3.3	3.5
14	3.2	3.5
15	2.9	3.5
16	2.4	3.0
17	2.2	3.5
18	2.3	3.3
19	2.2	3.6
20	2.7	3.5
21	2.1	3.4
22	2.2	3.1
23	2.0	3.0
24	1.6	2.7
25	2.0	3.6
26	2.5	3.1
27	2.5	3.3
28	2.0	3.0
29	1.8	2.5
30	3.0	4.2
31		

* Concentrations corrected for mast efficiency and to sea level pressure.

TABLE 23

Ozone (O_3) Concentrations (pphm)*

LITSTER STATION - HUNTINGTON

(1970)

Daily Averages and High Hour Readings

Day	NOVEMBER		DECEMBER	
	Daily Average	High Hour	Daily Average	High Hour
1			2.3	3.1
2				
3			2.5	3.9
4				
5			3.4	4.4
6				
7				
8				
9				
10				
11				
12				
13	3.3	3.7		
14	4.0	10.1	1.5	1.7
15	4.0	8.8	2.6	3.9
16	3.4	4.7	2.6	3.5
17	2.4	3.9		
18	2.4	4.2		
19	3.0	4.1		
20	1.6	3.1		
21	2.3	3.3		
22	2.4	3.3		
23	2.4	3.0	3.2	3.9
24	1.9	3.1	2.2	3.6
25	2.0	3.0	2.2	3.1
26	2.4	3.1	1.9	3.1
27	2.3	3.3	2.0	3.3
28	2.1	2.8	2.1	3.3
29	1.7	2.5	2.1	3.1
30	2.9	4.4	2.3	3.6
31			2.0	3.3

* Concentrations corrected for mast efficiency and to sea level pressure.

TABLE 24

Ozone (O_3) Concentration (pphm)*

LITSTER STATION - HUNTINGTON

(1971)

Daily Averages and High Hour Readings

Day	JANUARY		FEBRUARY	
	Daily Average	High Hour	Daily Average	High Hour
1			0.8	2.0
2			1.1	2.0
3			2.8	3.3
4			3.1	4.2
5			3.6	4.1
6			3.4	4.1
7			2.7	3.9
8			2.6	4.2
9			2.0	2.7
10			2.0	3.6
11			3.3	4.2
12			2.2	3.7
13			1.6	2.7
14			1.6	3.1
15			1.9	3.3
16			2.3	3.9
17			2.3	3.1
18			2.7	3.7
19	1.4	2.5	3.1	3.9
20	1.3	2.7	4.1	4.7
21	1.7	2.8	3.2	4.7
22	2.3	3.0	3.3	3.9
23	1.6	3.1	2.7	4.1
24	1.5	2.5	2.8	4.7
25	1.7	2.8	3.3	4.7
26	1.4	2.6	3.9	4.2
27	1.2	2.3		
28	1.5	2.8		
29	1.3	3.0		
30	1.4	2.5		
31	1.3	2.0		

* Concentrations corrected for mast efficiency and to sea level pressure.

UTAH STATE DIVISION OF HEALTH

CODE ESTABLISHING A
*TOTAL SUSPENDED PARTICULATE STANDARD FOR AMBIENT AIR

In the State of Utah the concentration of total suspended particulate matter in ambient air shall not exceed an annual geometric mean of 90 micrograms per cubic meter of air, with the further limitation that not more than 1% of the samples collected between April 1 and October 31 nor more than 5% of the samples collected between November 1 and March 31 shall exceed a concentration of 200 micrograms per cubic meter of air.

All sampling procedures used to obtain data in relation to this standard must be acceptable to the Executive Secretary and shall conform, as nearly as possible, to the following criteria:

a. Sampling stations shall be placed 15 to 50 feet above ground level and shall be located in areas of population concentration but not in areas zoned for heavy industry.

b. Samples shall be collected on a regular schedule of not less than every other day using a high-volume sampler equipped with an 8" x 10" MSA glass fiber filter. Samples of air shall be drawn through the filter continuously for periods of not less than 20 hours nor more than 28 hours and at a flow rate of not less than 20 cubic feet per minute. The sampling procedures enumerated may be used directly or employed as reference for calibration of other methods.

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* "Total Suspended Particulate" means any dispersed matter, collected by the above procedure, the individual aggregates of which are within the range of less than 50 microns in diameter but larger than single molecules.

UTAH STATE DIVISION OF HEALTH

Proposed

CODE OF AIR QUALITY REGULATIONS RELATING TO SULFUR DIOXIDE

In the State of Utah the concentration of sulfur dioxide* in ambient air at any given point shall not exceed either 0.02 parts per million (p.p.m.) by volume, calculated as an annual average, or 0.1 p.p.m. by volume, calculated as a daily average**, subject to the further restrictions that the

(a) concentrations shall never exceed 1.0 p.p.m., and may equal 1.0 p.p.m. for not more than 2 half-hour intervals in any day and not more than 20 half-hour intervals in any month;

(b) concentration may equal 0.5 p.p.m. for not more than 5 half-hour intervals in any day and not more than 60 half-hour intervals in any month.

The table below summarizes this standard for sulfur dioxide concentrations for the identified basic control periods, subject at all times to the annual and daily averages stated above.

Limits of SO_2* Concentration p.p.m. (volume)	Basic Control Periods		
	Period	Total Periods in any Day	Total Periods in any Month
0.02	one year	Not applicable	Not applicable
0.10	24 hours	Not applicable	**
0.50	½ hour	5	60
1.00	½ hour	2	20

Note 1: Year, month and day mean the calendar period

Note 2: Multiply p.p.m. by 2860 to convert to $\mu g/m^3$

* Includes both SO_2 and SO_3, as measured by a conductometric process as used in the Thomas Autometer, or an equivalent method approved by the Executive Secretary.

** Medical evidence, not fully substantiated, may indicate the desirability of including a limit on the number of consecutive days during which a daily average of 0.10 will be acceptable. A limit will be established as a specific requirement when valid data become available.

PART 410

EXCERPTS FROM NATIONAL PRIMARY AND SECONDARY AMBIENT AIR QUALITY STANDARDS

§ 410.1 Definitions.

(a) As used in this part, all terms not defined herein shall have the meaning given them by the Act.

(b) "Act" means the Clean Air Act, as amended (Public Law 91-604; 84 Stat. 1676).

(c) "Agency" means the Environmental Protection Agency.

(d) "Administrator" means the Administrator of the Environmental Protection Agency.

(e) "Ambient air" means that portion of the atmosphere, external to buildings, to which the general public has access.

"Reference method" means a method of sampling and analyzing for an air pollutant, as described in an appendix to this part.

(g) "Equivalent method" means any method of sampling and analyzing for an air pollutant which can be demonstrated to the Administrator's satisfaction to have a consistent relationship to the reference method.

§ 410.2 Scope.

(a) National primary and secondary ambient air quality standards under section 109 of the Act are set forth in this part.

(b) National primary ambient air quality standards define levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health. National secondary ambient air quality standards define levels of air quality which the Administrator judges necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Such standards are subject to revision, and additional primary and secondary standards may be promulgated as the Administrator deems necessary to protect the public health and welfare.

(c) The promulgation of national primary and secondary ambient air quality standards shall not be considered in any manner to allow significant deterioration of existing air quality in any portion of any State.

(d) The proposal, promulgation, or revision of national primary and secondary ambient air quality standards shall not prohibit any State from

establishing ambient air quality standards for that State or any portion thereof which are more stringent than the national standards.

§ 410.3 Reference conditions.

All measurements of air quality are corrected to a reference temperature of 25° C. and to a reference pressure of 760 millimeters of mercury (1.013.2 millibars).

§ 410.4 National primary ambient air quality standards for sulfur oxides (sulfur dioxide).

The national primary ambient air quality standards for sulfur oxides, measured as sulfur dioxide by the reference method described in Appendix A to this part, or by an equivalent method, are:

(a) 80 micrograms per cubic meter (0.03 p.p.m.)--annual arithmetic mean.

(b) 365 micrograms per cubic meter (0.14 p.p.m.)--maximum 24-hour concentration not to be exceeded more than once per year.

§ 410.5 National secondary ambient air quality standards for sulfur oxides (sulfur dioxide).

The national secondary ambient air quality standards for sulfur oxides, measured as sulfur dioxide by the reference method described in Appendix A to this part, or by an equivalent method, are:

(a) 60 micrograms per cubic meter (0.02 p.p.m.)--annual arithmetic mean.

(b) 260 micrograms per cubic meter (0.1 p.p.m.)--maximum 24-hour concentration not to be exceeded more than once per year, as a guide to be used in assessing implementation plans to achieve the annual standard.

(c) 1,300 micrograms per cubic meter (0.5 p.p.m.)--maximum 3-hour concentration not to be exceeded more than once per year.

§ 410.6 National primary ambient air quality standards for particulate matter.

The national primary ambient air quality standards for particulate matter, measured by the reference method described in Appendix B to this part, or by an equivalent method, are:

(a) 75 micrograms per cubic meter--annual geometric mean.

(b) 260 micrograms per cubic meter--maximum 24-hour concentration not to be exceeded more than once per year.

§ 410.7 National secondary ambient air quality standards for particulate matter.

The national secondary ambient air quality standards for particulate matter, measured by the reference method described in Appendix B to this part, or by an equivalent method, are:

(a) 60 micrograms per cubic meter--annual geometric mean, as a guide to be used in assessing implementation plans to achieve the 24-hour standard.

(b) 150 micrograms per cubic meter--maximum 24-hour concentration not to be exceeded more than once per year.

§§ 410.8 National primary and secondary ambient air quality standards for carbon monoxide.

The national primary and secondary ambient air quality standards for carbon monoxide, measured by the reference method described in Appendix C to this part, or by an equivalent method, are:

(a) 10 milligrams per cubic meter (9 p.p.m.)--maximum 8-hour concentration not to be exceeded more than once per year.

(b) 40 milligrams per cubic meter (35 p.p.m.)--maximum 1-hour concentration not to be exceeded more than once per year.

§§ 410.9 National primary and secondary ambient air quality standards for photochemical oxidants.

The national primary and secondary ambient air quality standard for photochemical oxidants, measured and corrected for interferences due to nitrogen oxides and sulfur dioxide by the reference method described in Appendix D to this part, or by an equivalent method, is: 160 micrograms per cubic meter (0.08 p.p.m.)--maximum 1-hour concentration not to be exceeded more than once per year.

§§ 410.10 National primary and secondary ambient air quality standard for hydrocarbons.

The hydrocarbons standard is for use as a guide in devising implementation plans to achieve oxidant standards.

The national primary and secondary ambient air quality standard for hydrocarbons, measured and corrected for methane by the reference method described in Appendix E to this part, or by an equivalent method, is: 160 micrograms per cubic meter (0.24 p.p.m.)--maximum 3-hour concentration (6 to 9 a.m.) not to be exceeded more than once per year.

§§ 410.11 National primary and secondary ambient air quality standard for nitrogen dioxide.

The national primary and secondary ambient air quality standard for nitrogen dioxide, measured by the reference method described in Appendix F to this part, or by an equivalent method, is: 100 micrograms per cubic meter (0.05 p.p.m.)--annual arithmetic mean.

EXCERPT FROM RULES AND REGULATIONS--STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES, EPA, DECEMBER 16, 1971
FOSSIL-FUEL FIRED STEAM GENERATORS

§60.42 Standard for Particulate Matter

On and after the date on which the performance test required to be conducted by § 60.8 is initiated no owner or operator subject to the provisions of this part shall discharge or cause the discharge into the atmosphere of particulate matter which is:

(a) In excess of 0.10 lb. per million B.t.u. heat input (0.18 g. per million cal.) maximum 2-hour average.

(b) Greater than 20 percent opacity, except that 40 percent opacity shall be permissible for not more than 2 minutes in any hour.

(c) Where the presence of uncombined water is the only reason for failure to meet the requirements of paragraph (b) of this section such failure shall not be a violation of this section.

§60.43 Standard for Sulfur Dioxide

On and after the date on which the performance test required to be conducted by § 60.8 is initiated no owner or operator subject to the provisions of this part shall discharge or cause the discharge into the atmosphere of sulfur dioxide in excess of:

(a) 0.80 lb. per million B.t.u. heat input (1.4 g. per million cal.), maximum 2-hour average, when liquid fossil fuel is burned.

(b) 1.2 lbs. per million B.t.u. heat input (2.2 g. per million cal.), maximum 2-hour average, when solid fossil fuel is burned.

§ 60.44 Standard for Nitrogen Oxides

On and after the date on which the performance test required to be conducted by § 60.8 is initiated no owner or operator subject to the provisions of this part shall discharge or cause the discharge into the atmosphere of nitrogen oxides in excess of:

(a) 0.20 lb. per million B.t.u. heat input (0.36 g. per million cal.), maximum 2-hour average, expressed as NO_2, when gaseous fossil fuel is burned.

(b) 0.30 lb. per million B.t.u. heat input (0.54 g. per million cal.), maximum 2-hour average, expressed as NO_2, when liquid fossil fuel is burned.

(c) 0.70 lb. per million B.t.u. heat input (1.26 g. per million cal.), maximum 2-hour average, expressed as NO_2 when solid fossil-fuel (except lignite) is burned.

Right Fork of Huntington Canyon

The 30,000 acre-foot reservoir will provide fishing and boating and will be an excellent addition to the recreational resources of the area.

The stream flows below the dam will be less subject to fluctuation than at present. The attached inflow and outflow diagrams outline intended operation releases during a typical (1) wet year, (2) average year, and (3) dry year. Release from Electric Lake will depend upon the type of water year experienced.

1. Wet Year - The February 1st snow survey will indicate a high spring runoff. Storage release can begin and be increased during March and April if the progressive snow surveys indicate a sufficiently high runoff as in 1952. The reservoir will probably not be drawn down more than 30 feet (10,000 acre-feet) for this type of flood control. The reservoir is not large enough to fully control the excessive runoff during a wet year, and outflow may exceed 200 cfs during May and June. For the remainder of the year, the outflow will be 10 cfs or more.

   The relatively small 30 square-mile drainage area is somewhat unique with this reservoir. Studies have indicated that a flash flood is probably the most serious flood condition, and the dam and spillway will be designed to accommodate severe flash flooding, reducing downstream flows to a factor of 1/8. Thus, flash floods that would have been disastrous to fish will very likely be eliminated.

2. Average Year - Storage release will begin sometime in January. The Company estimates the flow below the reservoir will remain 10 cfs or above until September or October and as low as eight cfs in November and December. Storage requirements during the spring should hold the maximum runoff release to about 90 cfs.

3. Dry Year - Downstream requirements for Electric Lake storage water should keep the outflow from the reservoir in excess of 10 cfs, except possibly during July and August. During eight months of the year, outflows would be substantially above inflows (giving a substantial benefit to fisheries). The Company would not reduce the outflow below six cfs unless inflow was below that figure.

   The operation outlined above is probable only under full development of the water supply. When the plant requirements are smaller, water releases should be above that indicated on the charts, except possibly in a dry year.

The project will add to the fishery potential because of added regulation, reducing very high runoffs and flood hazard, and increasing minimum flows--particularly in dry years.

Left Fork of Huntington Canyon

Water-storage rights purchased by the Company in the small Left Fork reservoirs could generally be utilized for fishing purposes. Twenty-three (23) per cent of the storage in the Left Fork Reservoirs has been acquired for the Huntington Canyon Plant and will be fully used for power purposes during drought years; however, it is likely that during the wet and average years, a portion of the water acquired might be held over in the reservoirs in anticipation of a drought year.

The power development will significantly improve the fishing potential of these small reservoirs and improve the downstream fishing in the Left Fork, since it will bring about a more gradual release of water throughout the year than is now the case under the present irrigation operation.

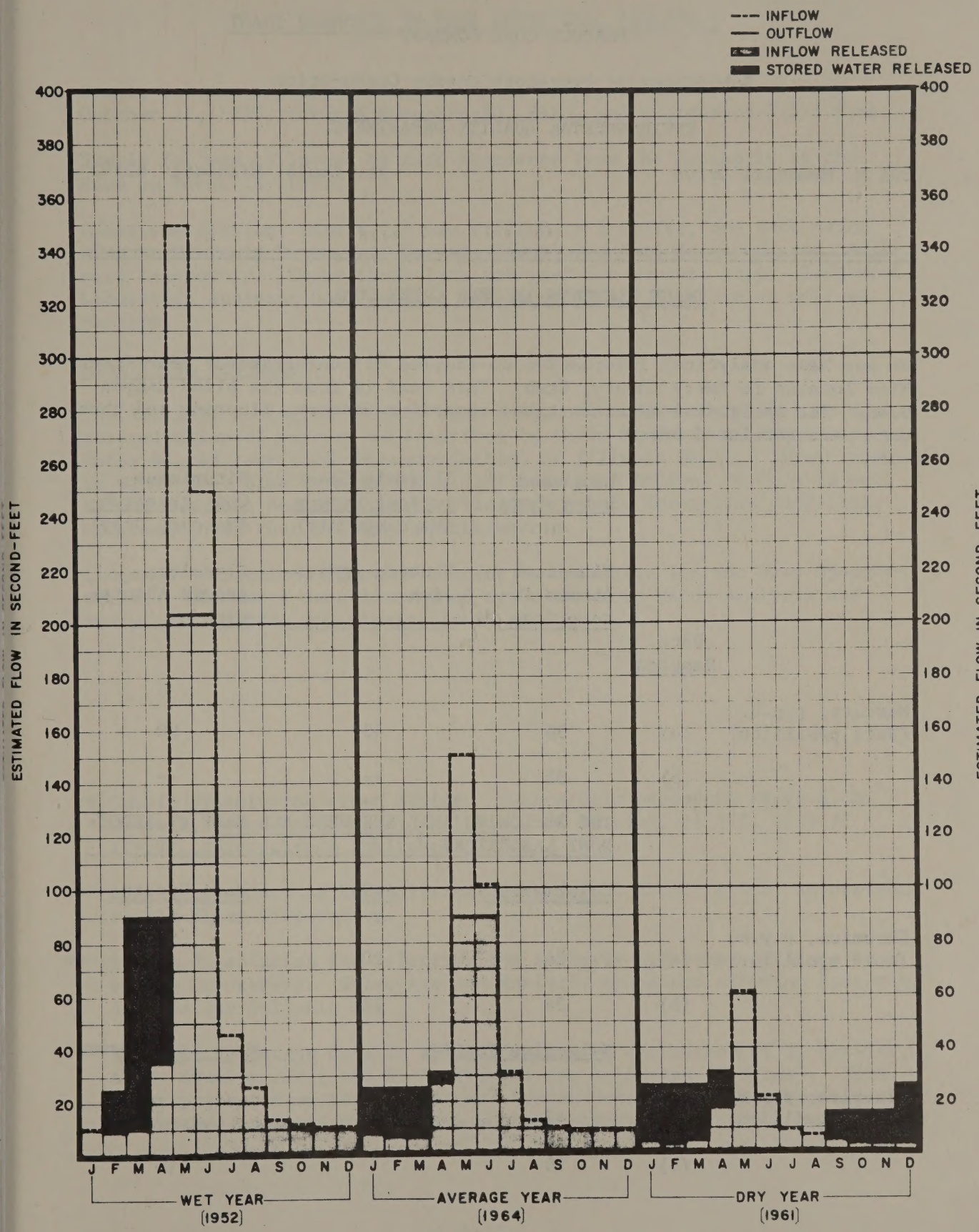
Stream Flows Below Powerplant

Fishing in Huntington Creek below the plant will be adversely affected because the plant will be one of the main stream diversions. Although there are four miles between the powerplant and the main Cleveland "Highline" Canal Diversion, there are two additional small diversions between these two points.

The first diversion is approximately one-half mile below the plantsite. It would appear that any fish in the stream at this point could be lost in the irrigation system, and that the stream is probably not stocked or fished extensively below the plantsite.

Flows recorded at the USGS gaging station a little over a mile below the plantsite get down to two cfs, and the stream is, in effect, dry at times below irrigation diversions.

ELECTRIC LAKE MAXIMUM OPERATION DURING A WET, AVERAGE & DRY YEAR



PEABODY COAL COMPANY

Subsidiary of Kennecott Copper Corporation

ENVIRONMENTAL QUALITY DEPARTMENT

301 N. Memorial Drive St. Louis, Missouri 63102

TRACE ELEMENTS IN DEER CREEK COAL

We now have analytical information on samples of coal from our Deer Creek Mine located in Emery County, Utah. This coal is from the Blind Canyon Seam. The analytical determinations regarding mercury, fluorine and chromates are tabulated below:

	Date Sampled	Ledgemont Laboratory Flameless Atomic Absorption	Illinois Geological Survey (Mercury Only) Neutron Activation	Bituminous Coal Research (Mercury Only) Flameless Atomic Absorption
Mercury, p.p.b. (Note ppbillion)	(a)	50	40	90
	(b)	35	--	--

THE FOLLOWING ANALYSES WERE ALL MADE BY LEDGEMONT LABORATORY

		Colormetric*	AAS**	Mass Spectro
Chromium, p.p.m. (Note ppmillion)	(a)	26	20	--
	(b)	24	22	--

		Selective Ion***	Mass Spectro****
Fluorine, p.p.m. (Note ppmillion)	(a)	42	5
	(b)	39	10

Sample (a) was collected from the track hopper at Nevada Power from October 22, 1970, through November 30, 1970, and represents 3,375 tons.

Sample (b) was collected by ASTM Standards from the stockpile at the Mine on March 13, 1971.

After compositing, sample (a) was riffled to 3 splits, one each being sent to Illinois Geological Survey, Bituminous Coal Research, and Ledgemont Laboratory. These three labs analyzed for mercury only. Ledgemont Laboratory analyzed both samples for chromium and fluorine as well as mercury.

ANALYTICAL TECHNIQUES

The Illinois Geological Survey uses a Neutron Activation technique for determination of mercury as described in their Environmental Geology Notes No. 43, entitled "Mercury Content of Illinois Coals." Their results on Black Mesa Blue Seam is identified merely as Arizona in this report. Bituminous Coal Research used a Flameless Atomic Absorption technique. Ledgemont used that and Mass Spectrometric.

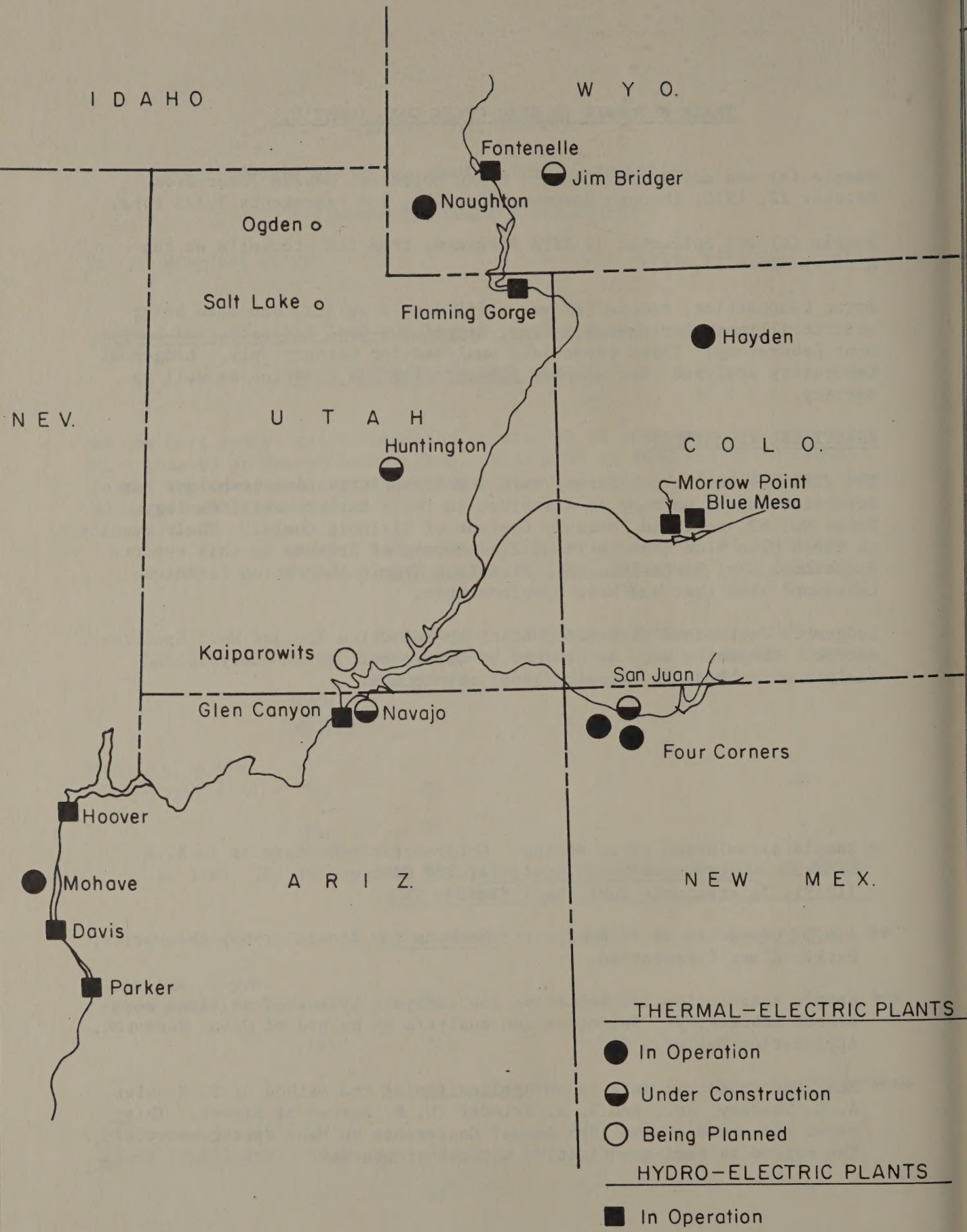
Ledgemont determined fluoride content by Selective Ion and Mass Spectrometric. Chromates were determined by Colormetric Metal Analysis and Analytical Methods for Atomic (1968) absorption.

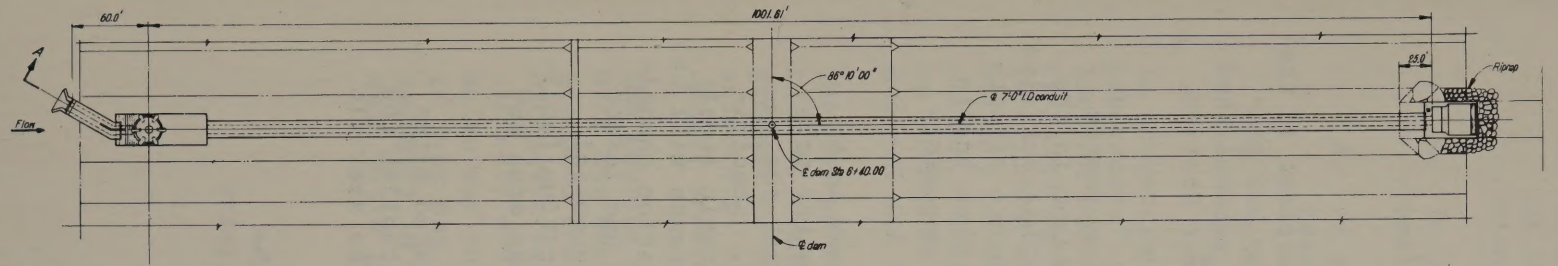
* Sample dissolution after ashing. Colormetric procedure as in E. B. Sandell, Colormetric Metal Analysis, 3rd Edition, pp 392, Part II (1959), Interscience Publishers, Inc.

** A.A.S. procedure as in Analytical Methods for Atomic (1968) Absorption, Perkin-Elmer Corporation.

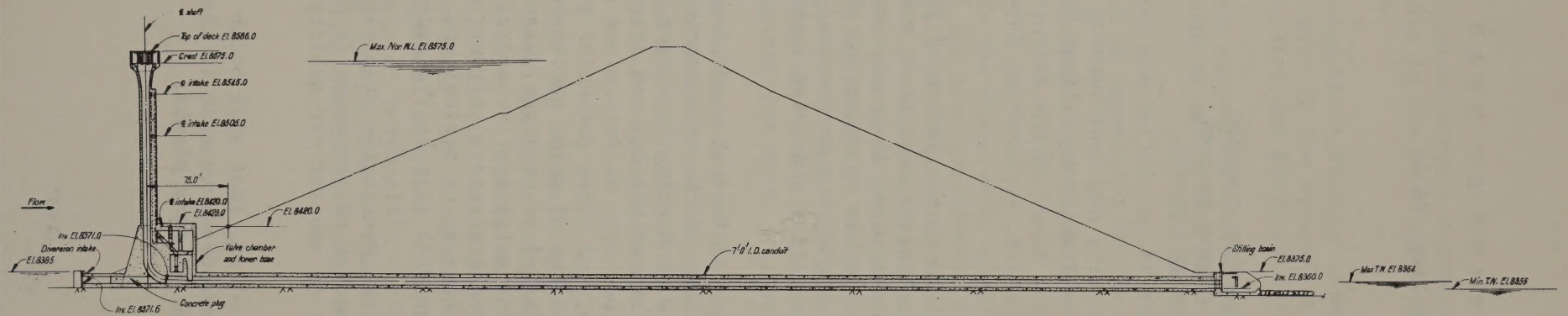
*** Sample dissolution for selective ion analysis by method of Alcoa Research Laboratory. Selective ion analysis by method of Orion Research, Application Bulletin #5.

**** Mass Spectrometric data is an application of the method of T. Kessler, A. G. Sharkey, Jr., and R. A. Friedel (U. S. Bureau of Mines). This paper presented at the 19th Annual Conference on Mass Spectrometry. The method is semi-quantitative without standards.


IDAHO
WYO.
Fontenelle
Jim Bridger
Naughton
Ogden
Salt Lake
Flaming Gorge
Hayden
NEV.
UTAH
Huntington
COLO.
Morrow Point
Blue Mesa
Kaiparowits
San Juan
Glen Canyon
Navajo
Four Corners
Hoover
Mohave
ARIZ.
NEW MEX.
Davis
Parker
THERMAL-ELECTRIC PLANTS
In Operation
Under Construction
Being Planned
HYDRO-ELECTRIC PLANTS
In Operation



PLAN



A–A

A-34

Scale 0 40 80 Feet
1"=40'

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PLAN.				
STAFF				CHENGR.

REV. NO.	DATE	NATURE OF REVISION	BY	CHKD.	APPD.

UTAH POWER & LIGHT COMPANY
ELECTRIC LAKE DAM
EMERY COUNTY, UTAH — WATER RIGHT NO 39151
SPILLWAY & OUTLET WORKS

GENERAL PLAN & SECTION

HARZA ENGINEERING COMPANY
APPROVED _____
CHICAGO, ILLINOIS | DATE AUGUST 1971 | DWG. NO. 566 C14

THE UNIVERSITY OF UTAH

Salt Lake City 84112

Utah Engineering Experiment Station
207 Mines Building

UTAH POWER & LIGHT COMPANY
HUNTINGTON CANYON PROJECT
ENVIRONMENTAL STUDIES

In connection with the development of a new coal-burning powerplant in the Huntington Canyon area of Utah, the Utah Power & Light Company has contracted for a complete environmental study of the area to be accomplished by the Center for Environmental Studies, Engineering Experiment Station, University of Utah.

This comprehensive study will include an evaluation of the Atmospheric, Vegetation, Animal, and general Ecological conditions now present in the Huntington Canyon area before the new plant is constructed. This detailed background information will be invaluable in assessing the future effects of powerplant operation upon the neighboring environment and thus enable Utah Power & Light Company to provide the indicated controls necessary to the protection of the environment.

The objective of the vegetation and ecological conditions study is to obtain background data on the ecology of the area surrounding the prospective power-generating plantsite in Huntington Canyon so that the potential air pollution hazard can be established and assessed. Specifically, the existing vegetation types will be determined and their sensitivity to sulfur dioxide, fly ash, and other potential pollutants will be assessed. The existing general status of major native vegetation associations and species will be established as to vigor, disease, and insect conditions to provide baseline data sufficient to appraise potential ecological risks emanating from the presence of a power-generating facility at this location. Potential hazards to agriculture in the area and to ornamental plants in Huntington will also be evaluated.

A five-year air quality study in the Huntington area and related sites is proposed. The long-range objective of the study is to establish the influence of the Huntington Plant on ambient air quality. The specific aims are as follows:

1. To predict concentrations of SO_2 that will occur in the Huntington area based on measurements made in the vicinity of other Utah Power & Light Company plants.

2. To establish background concentrations of SO_2, O_3, NO_x, and particulate in the Huntington area prior to the station operation.

3. To determine the influence of the power generating station at Huntington on the concentrations of SO_2, NO_x, and particulate after the plant is in operation.

4. To predict concentrations of SO_2, NO_x, and particulate that would occur as additional units are added.

5. To predict the influence, if any, of the projected future emissions on vegetation in the area.

6. To establish a sound basis for a surveillance and monitoring program in the future.

In connection with the above work, a well-equipped "Mobile Environmental Laboratory" (MEL) has been constructed to provide for on-the-spot collection and analysis of soil, air, water, insect, and plant specimens as required in the total environment study. The MEL is a self-contained laboratory with its own power-generating facilities and contains a wide variety of scientific sampling, measuring, and analytical instrumentation. Under normal circumstances the MEL with trained technicians will be available on very short notice to proceed to the area where tests are desired and accomplish its work.

The Center for Environmental Studies is fortunate to have on its staff a team of highly qualified scientists who possess extensive industrial backgrounds as well as academic qualifications covering the wide variety of scientific disciplines necessary to the study and solution of environmental problems.

The growing need for the marshalling of technological resources to cope with the serious problems threatening the quality of our environment has prompted the University to structure this program, aimed at making the extensive expertise and facilities now present at the school available to industry and government in a concerted effort to study and find means to solve our environmental problems. The Huntington Canyon project for UP&L is just one example of responsible action being taken by a forward-looking industry in their recognition of the necessity of protecting our environment while providing needed services to the community.

OUTLINE OF STUDY OF THE EFFECTS OF A COAL-BURNING POWERPLANT AND ASSOCIATED RESERVOIR ON THE AQUATIC ECOSYSTEM

Brigham Young University

Robert N. Winget, Brigham Young University, Center for Environmental Studies, Provo, Utah 84601

The objectives of this study are to determine effects on the aquatic ecosystem caused by emissions and effluent from a coal-burning powerplant, and an associated 30,000 acre-foot reservoir to be constructed in Central Utah.

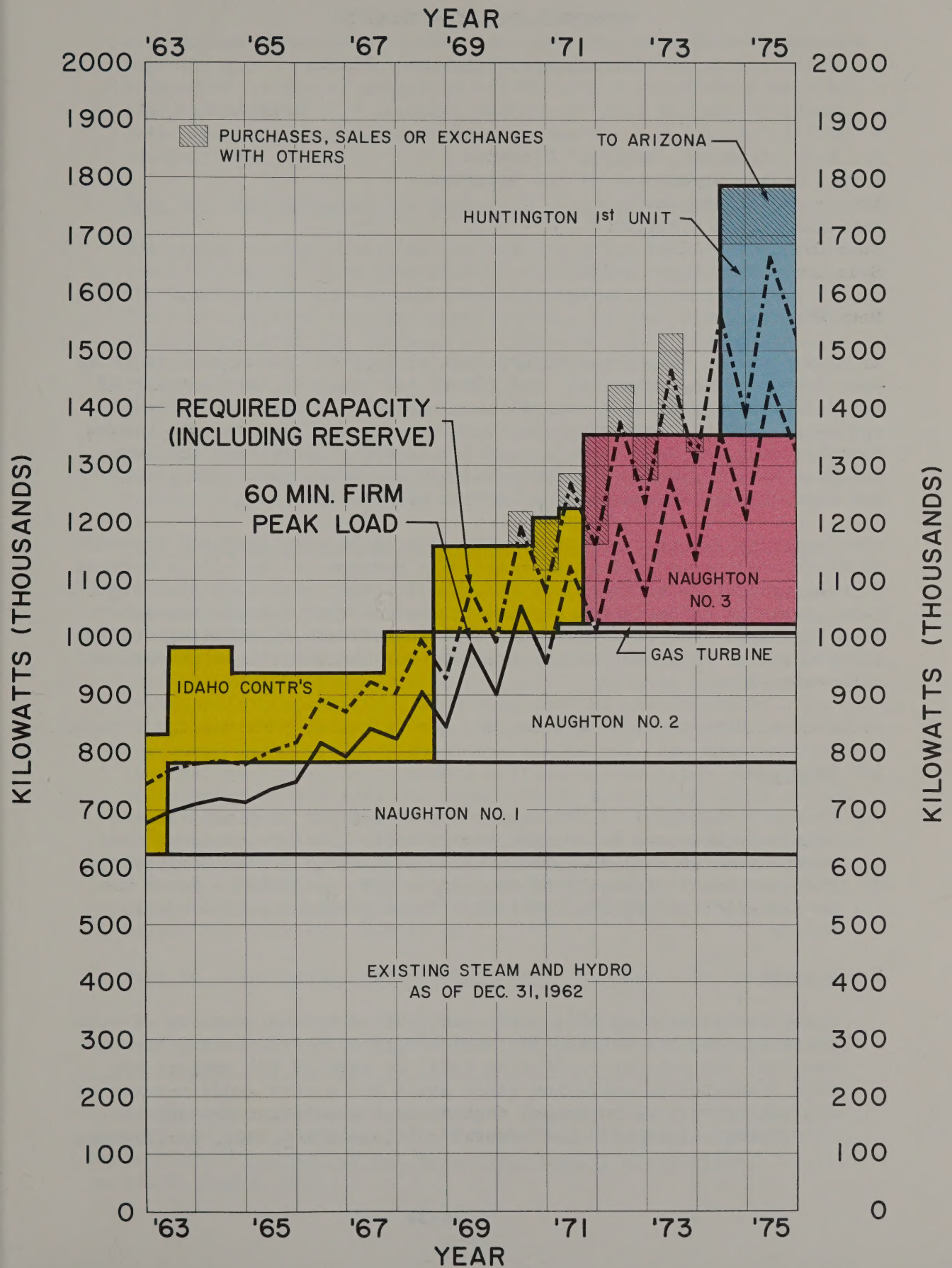
APPROACH: During the first year of the study, components of the flora and fauna and chemical and physical parameters will be determined at 14 stations on various streams, reservoirs, and lakes peripheral to the proposed plant. Detailed analyses will be made of the ecosystem of Huntington Creek upon which the proposed reservoir and powerplant will be built.

Physical and chemical parameters to be determined include: (1) total suspended solids, including fly ash; (2) dissolved nitrates, nitrites, sulfur compounds, phosphates, carbonates, silicon compounds, fluorides, selected metal ions, oxygen, and CO_2; (3) pH, alkalinity, turbidity and temperature. Concentrations of fly ash and potential pollutants in accumulated snowcover will also be determined.

This study is anticipated to be continued for four years prior to the operation of the plant, and at annual or biennial intervals for as long as ten years after the plant begins operation.

SUPPORTED BY: Utah Power & Light Company and Brigham Young University.

UTAH POWER & LIGHT COMPANY
PEAK LOAD & PEAKING CAPABILITY



C O P Y

TENNESSEE VALLEY AUTHORITY

Chattanooga, Tennessee 37401

October 7, 1971

Mr. D. L. Crandall, Regional Director
United States Department of the Interior
Bureau of Reclamation
Regional Office - Region 4
Post Office Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

We have reviewed the "Joint Meteorological Report" transmitted to us by your letter of September 14. The report concerns the interactions of air pollutants from major southwestern powerplants that are either in operation, planned, or under construction. Plants included are Mohave, Four Corners, San Juan, Navajo, and Huntington. Except for San Juan and Four Corners, which are approximately 10 miles apart, the plants are separated by distances ranging from 167 to 235 miles.

The report is informative and should prove to be very useful. The airshed rationale presented seems reasonable because of the widely varying physiographical features of the Colorado Plateau. The fact that significant levels of oxidants are present in the Colorado Plateau atmosphere is a legitimate concern, since the combined effects of existing oxidants and powerplant effluents may be greater than the effects of powerplant effluents alone.

Although we have no major criticisms, the following comments are offered.

1. General

   The main objective of the report was to analyze combined effects (whatever they may be) of the powerplants. The ground-level concentrations of SO_2, NO_2, and particulates (considering meteorology) that may result from all of the plants were evaluated. There was no consideration of the combined effects of these plants on visibility.

2. General

   The effectiveness of this study was limited by the scarcity of data. There was an obvious need for onsite meteorological data. The same was true for ambient monitoring data, as most of the ambient SO_2 data consisted of sulfation rates which are a very crude measure of SO_2 pollution. We recommend that at each powerplant an adequate meteorological station and several continuous SO_2, NO_2, particulate,

and oxidant monitors be located at the point or points of maximum impact. There is an immediate need for these data to establish background levels of pollution before all of the other plants become operational. If adequate background data are not obtained, later questions regarding changes in ambient air quality will be unanswerable.

3. Page 23, last paragraph in Section 2 - Inversion Breakup (Fumigation)

The report states that, "An increase in stack height can decrease the frequency of this phenomenon, but will not appreciably affect the magnitude of the ground-level concentration when it does occur." The first part of the statement is true, if the contributors are considering that the increase in effective stack height elevates the plume above the lower stable air and precludes the occurrence of inversion breakup. The second part of the statement is not correct--the higher stack will result in a higher "effective stack," and ground-level concentrations after plume breakup are inversely proportional to effective stack height, assuming all other plant operational and meteorological conditions remain the same. This relationship is illustrated by TVA plume dispersion models.*

4. Page 24, last paragraph in Section 3, Limited Mixing (Trapping)

The report states that, "Changes in stack height usually will not change frequency of occurrence, which depends on the climatology at the location, but height changes can decrease the magnitude of ground-level concentration and increase the distance from the source that the maximum concentrations occur." Assuming the authors mean increase in stack height, such frequency of occurrence will be changed if the stack height is great enough to get a significant portion of the plume into that portion of the stable air that does not undergo temperature transition. When a portion of the plume remains in the undisturbed stable air, the magnitude of the ground-level concentration will be decreased with increased stack height as stated in the report. TVA experience has indicated that maximum surface concentrations due to trapping usually occur relatively near the plant, 5 to 10 kilometers. There is no indication that the distance to the point of the maximum ground-level concentration is dependent on stack height for trapping conditions.

5. Page 26, last paragraph in "Stagnation" Section

The writers infer that the potential pollution effects in large metropolitan areas during stagnation episodes can be regarded as

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*S. B. Carpenter, William C. Colbaugh, Jack M. Leavitt, Thomas L. Montgomery, and Fred W. Thomas, "Principal Plume Dispersion Models: TVA Powerplants," Journal of Air Pollution Control Association, 21 (8), pp 491-5, August 1971.

being similar to those in open country with a few large isolated powerplant emission sources. This comparison is not valid as, in many cases, atmospheric dispersion conditions may be relatively favorable for large powerplants with high stacks during the daytime periods of extended stagnation.

6. Page 29, Dames & Moore Diffusion Model

The Dames & Moore model showed that very low and insignificant concentrations of plant effluents occur at great distances from the plants. This is no doubt true; however, the Dames & Moore model was not associated with a given averaging time as it should have been. Very little justification was given for the 11.5° plume spread with distance. It would have been preferable to extrapolate a spread from known dispersion coefficients.

We have no objection to your releasing these comments to any other intersted individuals, groups, or agencies.

Very truly yours,

(Sgd) G. O. Wessenauer
Consultant

ADDENDUM TO REPORT #706-A
"A METEOROLOGICAL EVALUATION OF DISPERSION OF STACK EFFLUENT FROM THE PROPOSED POWERPLANT IN HUNTINGTON CANYON, EMERY COUNTY, UTAH"

By

NORTH AMERICAN WEATHER CONSULTANTS

Since the issuance of Report 706-A, a question has been raised concerning the possibility of high concentrations of SO_2 arising from the movement of the plume to the canyon wall under stable low air movement conditions. The calculations of concentrations under potential plume trapping conditions appearing in 706-A are pertinent to this case. They are generally under .35 p.p.m. (See Figure 4.17, page 55).

A draft (3-72) of the "Meteorological Aspects - Southwest Energy Study" invokes a different type of model under these conditions, involving the direct impaction of the plume centerline on the canyon wall. This produces concentrations well over an order of magnitude higher than those of the plume trapping model. Support for this impaction model has been attributed to the measurements made in the late 1930's near Trail, British Columbia, Canada. This addendum consists of a discussion of this matter.

The conventional Gaussian plume calculations are based upon plume dispersion in a steady state, uniform ambient air flow. Air motion across a canyon toward a wall is decidely non-uniform. Continuity of mass requires that it decelerate on approaching the wall and deflect one way or another, or spread laterally or vertically, or both. In the usual canyon regime it will be deflected laterally toward the basic up or down-canyon flow. In the absence of up or down-canyon flow, it will deflect up-heated slopes and down-cooled slopes. If there is a synoptic scale cross-canyon flow, it will descend into the canyon on passing across the upwind wall and will ascend on the downwind wall. If the air mass is stable in the canyon, the upper air may simply ride over the top of the canyon air. If the synoptic scale cross-canyon flow consists of stable air, the air will be driven down the downwind facing wall and up the upwind facing wall.

Because of the twisting and turning of the air flow in short distances, the use of an anemometer at one site to represent the air flow, even only a few kilometers away, is a risky procedure.

The centerline of the plume moves along a streamline in the downwind direction, while the outer boundary crosses streamlines because of diffusion. A streamline passing through an elevated source cannot impact directly on a canyon wall except at a stagnation point where the air stream speed drops to zero. A particle carried along such a streamline, or any other conceivable centerline streamline, cannot touch the wall.

The use of a model based upon direct impaction of a plume centerline on a canyon wall seems implausible on the basis of the above factors, whether the

canyon air mass is stable or not. On the other hand, the plume trapping model appears much more reasonable for application to the stable low flow case. It provides a single concentration number which pertains to the canyon floor, to the walls, and to the air mass under the mixing lid. Obviously, this model has some imperfections, particularly in the vicinity of the initial plume and before the plume has been "reflected" many times from the canyon floor, walls, and the lid.

In the absence of any truly adequate model for transport and diffusion under cross-canyon flows, it appears necessary to draw inferences from actual observations of concentrations made downwind of SO_2 sources under similar circumstances. A well documented case (Hewson 1945 and Hewson and Gill 1944) is that for the canyon below Trail, British Columbia. The canyon has a similar geometry to that of Huntington Canyon. The wind flow patterns are also similar, and there is a cross-canyon flow at times due to heating of the sun-facing slope. Aerial and ground observations were made near Trail and downwind thereof over a period of several years in the late 1930's. In particular, many measurements were made in the vicinity of Columbia Gardens, about 10 km downwind from the source at Trail. In the early morning, the plume, which leveled off at about 1000 feet above the plantsite, drifted down the Columbia River Valley, but was also initially driven along the west wall which was being heated by the sun. A peak value at Columbia Gardens measured in the free air with an aircraft in vicinity of the west canyon wall, was 0.73 p.p.m. No measurements were made on the west slope on this date (August 10, 1938; 04.50-05.20 h). However, ground concentrations up to 0.99 p.p.m. were recorded on the west slopes (approximately 400 feet above the valley floor) on August 19, 1938, 08.01 h, while the corresponding value on the east side was 0.08 p.p.m.

When applying the same plume dispersion concept to Huntington Canyon, one must first consider the relative source strengths for the two locations. At Trail, the source strength of SO_2 was about 230 tons per day. This is roughly ten times the projected source strength for the first unit at Huntington. However, in the August 10, 1938, case, the aircraft measurements were made following a reduction in the SO_2 output. According to the figures on output and wind given in the text (1944 article), a reasonable source strength is about five times that for Huntington.

Secondly, consideration must be given to the distance from the source, which for Columbia Gardens is about 10 km and for the canyon wall under consideration in Huntington Canyon is 3 km. For a Gaussian plume under Pasquill's F condition, the plume centerline concentration at 3 km would be about five times that at 10 km. Multiplying and dividing by 5, it is seen that the cross sectional values in Figure 4 (1945 report) at 10 km distance should correspond to the plume values 3 km away from the Huntington plant.

No specific source strength is given for the August 19, 1938, data when 0.99 p.p.m. were measured on the west slope at Columbia Gardens. During the succeeding hour it averaged .58 p.p.m. Assuming the source strength

to be ten times that of Huntington and adjusting for the distance to 3 km, the corresponding Huntington average hourly value would be about 0.29 p.p.m. This value is in line with the highest values computed for Huntington Canyon with the box model.

The Southwest Energy Study draft analysis produced figures well over an order of magnitude higher than those for the plume trapping model on the Huntington Canyon wall, 3 km from the plantsite. This was based upon the following assumptions:

1. With light ($\leq$ 3 m.p.h.) southerly wind at night, there will be an F type plume (stable air, small diffusion).

2. The surface flow at the plantsite represents the flow at the stack height under light southerly flow conditions.

3. With a light southerly flow at stack height, the air moves straight and level across the canyon to the wall, 3 km away.

4. There will be plume centerline impaction, at full centerline concentration, on the canyon wall.

Assumption (1) seems reasonable although there will be cases where it is invalid. The stable layer will at times be below the effective stack height. In the absence of a mass of statistics on air-mass stability and air flow, it may be proposed as a conservative assumption.

Assumption (2) enables the anemometer data statistics at the plantsite to be used, as there is little data from a higher level. It is pointed out that "the wind direction can vary in the lower few hundred feet, but that it was felt that this variation occurred primarily during the short transition period from down-canyon to up-canyon flow." However, it is just during such transition flow that cross-canyon flow is likely to occur. These plantsite statistics were also employed to arrive at a 1.3% frequency of southerly, nighttime type F condition.

Assumption (3) is considered much too strong in view of the above discussion of canyon flow. The odds are strong that, as in the Trail case, the air deflects on approaching the canyon wall to either down or up-canyon flow. Tetroon balloon observations made at Huntington Canyon bear this out. If the southerly air flow is, on the other hand, a synoptic scale flow, and even though this synoptic scale air mass is stable, it will be driven up and over the canyon side.

Assumption (4) is regarded as faulty for these reasons:

(a) It fails to conform to considerations of continuity in the air flow.

(b) The information from Trail shows that it grossly overpredicts concentrations on the canyon wall.

Several of the assumptions rest upon the validity of others in the list. Since the validity of several is dubious, it would seem that the end result is even more dubious.

REFERENCES

Hewson, E. W. and G. C. Gill, 1944: Report submitted to the Trail Smelter Arbitral Tribunal - Part II Meteorological Investigation in Columbia River Valley near Trail, B. C. - Bulletin 453, U. S. Dept. of Interior, Bureau of Mines.

Hewson, E. W., 1945: The Meteorological Control of Atmospheric Pollution by Heavy Industry. Quart. J. Roy. Met. Soc. 71, 266-282.

COMMENTS ON ITEM 4 OF THE LETTER FROM THE ENVIRONMENTAL PROTECTION AGENCY TO THE SECRETARY OF THE INTERIOR DATED APRIL 10, 1972

By

A. Clyde Hill
University of Utah

The possibility of sulfur dioxide (SO_2) causing injury to vegetation in the Huntington Canyon area is under study by the University of Utah. The data available indicate that injury will not occur.

Sulfur dioxide has caused injury to vegetation in the vicinity of large SO_2 sources over the years, but emissions have been higher than they will be at Huntington. For example, SO_2 emissions from three smelters in Sudbury, Canada, have totaled 6,000 tons of SO_2 per day compared to the first Huntington unit with 33 to 45 tons per day. Eastern white pine growing in the Sudbury area is much more sensitive to SO_2 than plants growing native near Huntington, and damage has occurred to this and to a lesser extent other species. Sulfur dioxide emissions from a large copper smelter in the Salt Lake Valley have also caused injury to vegetation. The smelter has emitted as much as 2,000 tons of SO_2 per day, or 45 to 60 times the first unit of the Huntington Plant. Damage to crops has ranged from $6,000 to $48,000 per year, and native species on the adjacent mountain were also damaged before emissions were reduced. The Trail, British Columbia, smelter emitted as much as 665 tons SO_2 per day in 1930, or 15 to 20 times the first Huntington unit, and plant injury was extensive down the Columbia River Valley. Our studies near the Four Corners Powerplant in New Mexico in 1971 failed to show SO_2 injury to native vegetation and crop plants. This plant emitted about 280 tons SO_2 per day, and many of the species growing in the area are common near the Huntington Plantsite.

The native plant species growing in the lower portion of the Huntington Canyon are quite resistant to SO_2. Somewhat more sensitive species are found 1,500 to 2,500 feet above the valley floor near the plantsite and several miles up the canyon. A review of the SO_2 injury problem in Trail, British Columbia (a large smelter located in a river valley), indicates that high levels of SO_2 will probably not extend that high up the canyon walls. For example, at Trail, injury to vegetation is not observed more than about 750 feet above the valley floor in both the main and side canyons. The stacks at Trail are 425 feet tall, and larch, which is very sensitive to SO_2, is common.

Some of the crops growing on the farms down the river from the Huntington Plant are sensitive to SO_2 injury, but injury to crops has not been observed near other similar SO_2 sources of this magnitude. The relative

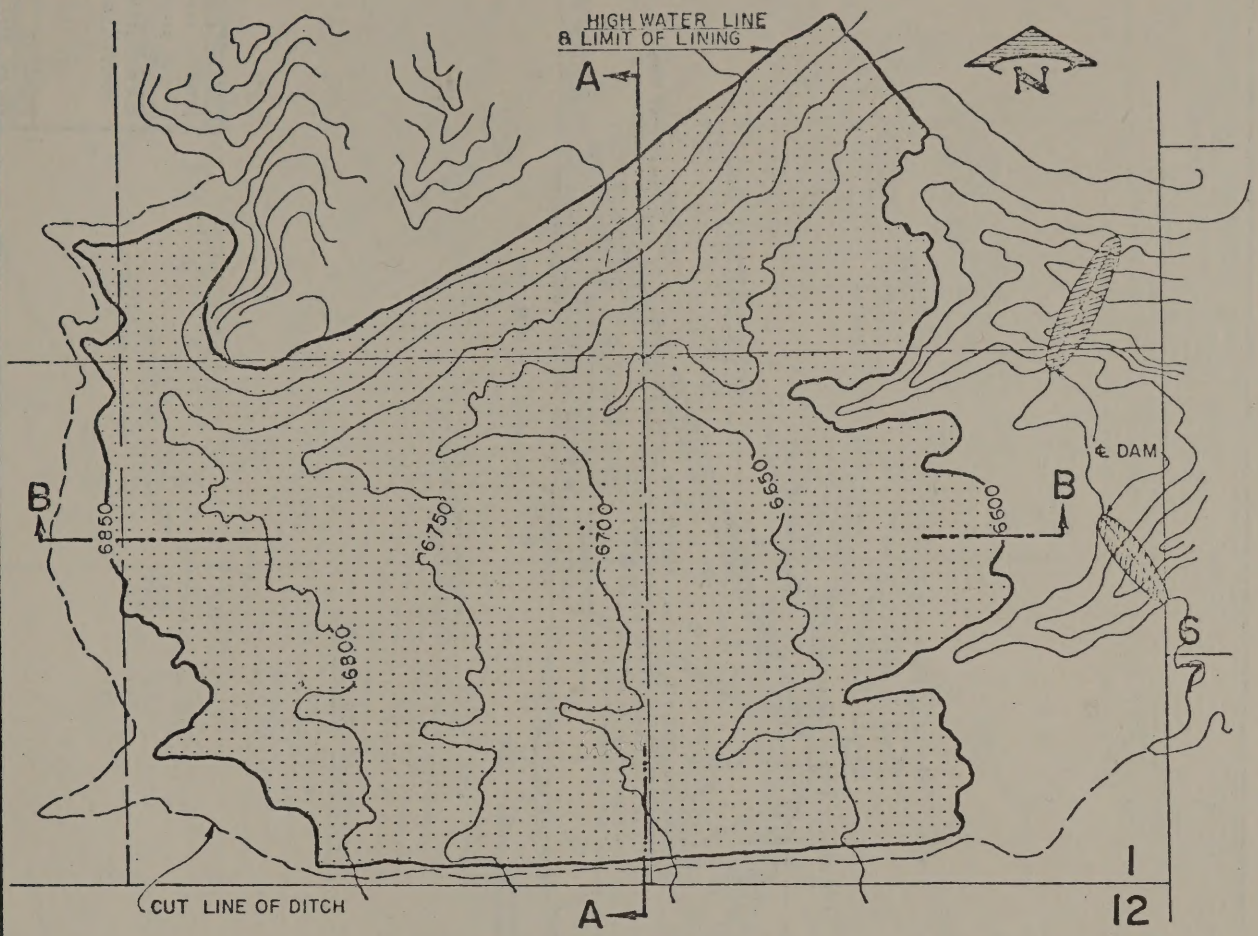
humidity and rainfall are both low in the Huntington area, and these factors both contribute to resistance to SO_2 injury.

Very little information is available relative to the combined effects of SO_2 and NO_2 for the species growing in the Huntington Canyon area. Since alfalfa is the most sensitive species growing in the Huntington Canyon area, fumigation studies were conducted with alfalfa. Under the conditions of the study, approximately 0.7 p.p.m. SO_2 for 2 hours was required to cause significant injury to alfalfa. In the presence of an equal amount of NO_2, alfalfa was injured at approximately 0.5 p.p.m. SO_2 indicating some combined effect.

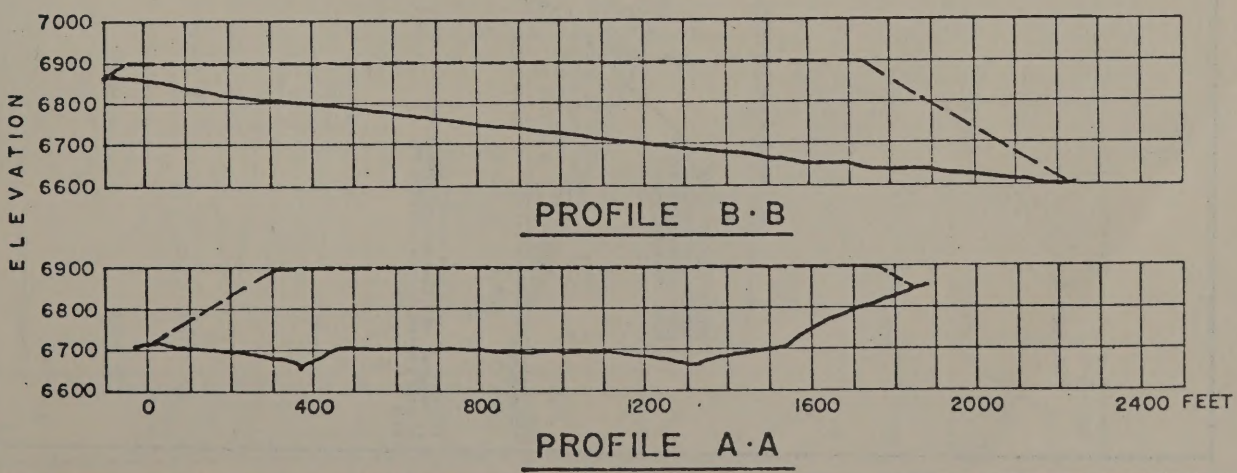
Sampling downwind from powerplants with emissions similar to those expected at Huntington showed that within a few miles from the plant, the NO_2 concentration was approximately 1/4 that of the SO_2. The remainder of the oxides of nitrogen were nitric oxide. Nitric oxide has no synergistic or additive effect with SO_2 at realistic concentrations. More data are needed for evaluation, but the combined effect of SO_2 and NO_2 appears to decrease when the relative NO_2 concentration decreases from 1 to 1 indicating that a synergism between NO_2 and SO_2 near a powerplant may not be of too much importance.

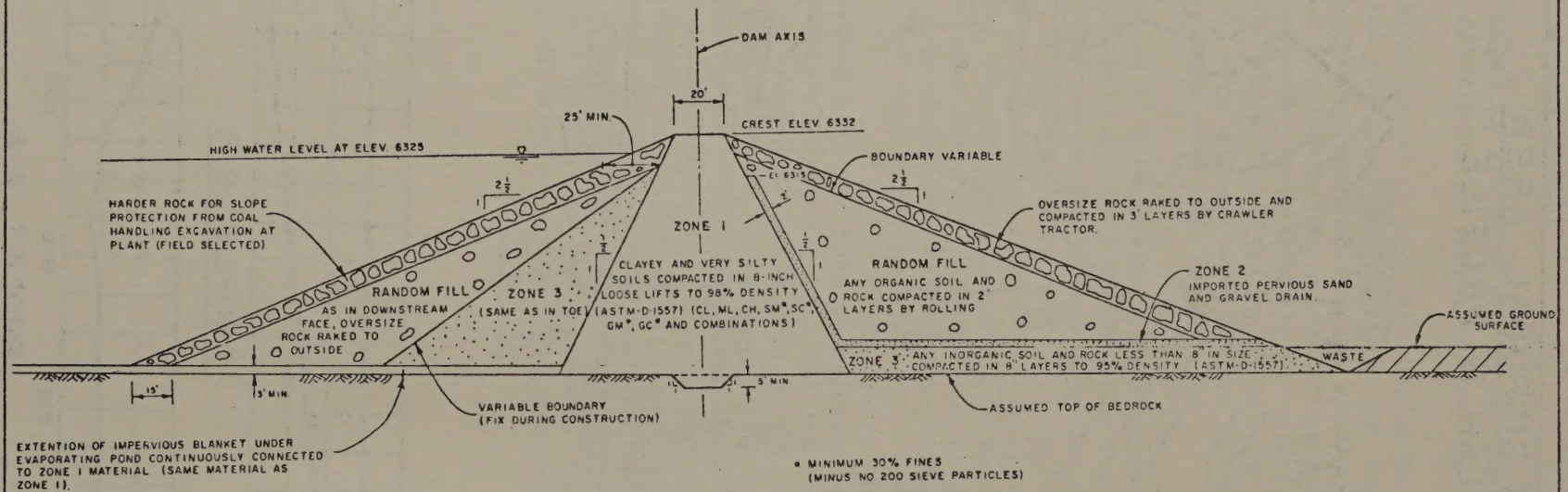
The data available indicate that vegetation injury will not occur at the SO_2 concentrations predicted by the TVA and North American Weather Consultants groups. The NOAA prediction of SO_2 concentrations appears to be extremely high based on all of our passed air sampling and vegetation observation experience. If concentrations as high as 52,000 $\mu g/m^3$ for 1 hour should occur in the high terrain periodically during the summer, injury to sensitive vegetation could be expected. In other areas, late spring and early summer SO_2 concentrations are much lower than during the winter when more stable conditions occur, and vegetation is far more sensitive in late spring and early summer. Vegetation is extremely resistant during the winter when maximum concentrations occur.

ASH DISPOSAL AREA
PLAN & PROFILE



PLAN





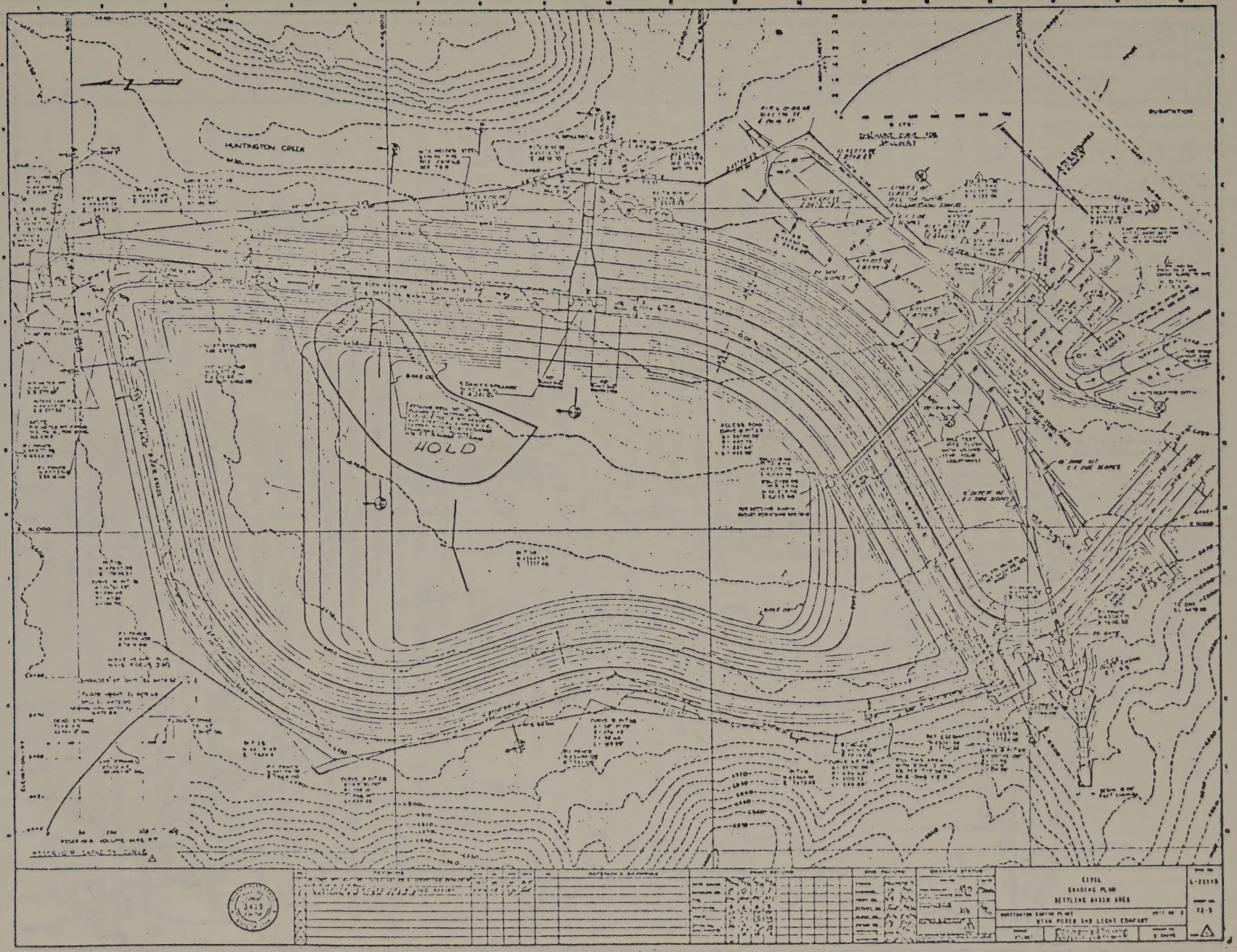
MAXIMUM SECTION

SCALE 1" = 60'

WOODWARD-CLEVENGER & ASSOC., INC.
Consulting Engineers & Geologists
Denver, Colorado

EVAPORATION BASIN
PROPOSED DAM SECTION

Prepared by: _____ Checked by: _____
Job No. 15742-12575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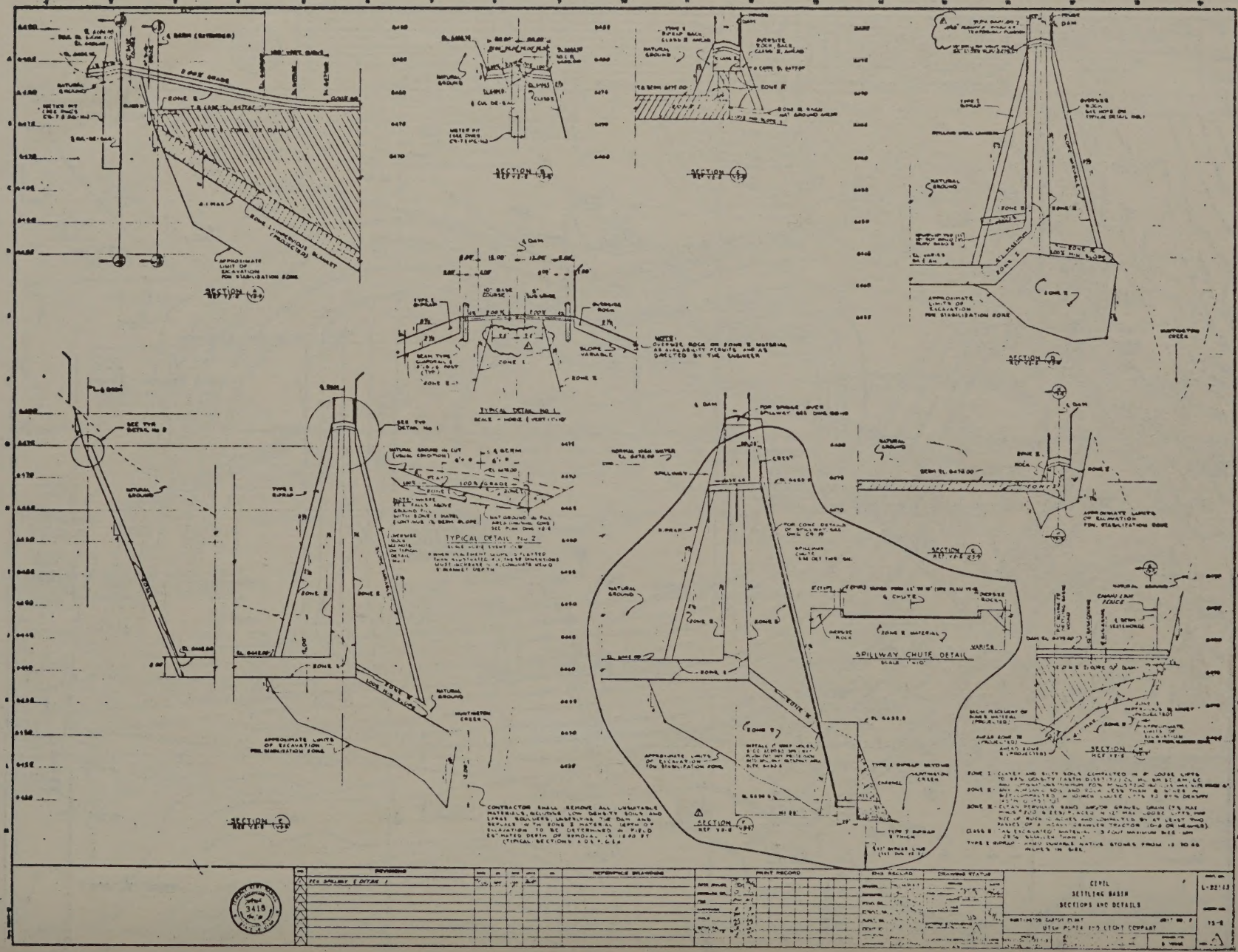
HOLD
CIVIL
GRADING PLAN
SETTLING BASIN AREA
HUNTINGTON CANYON PLANT
UTAH POWER AND LIGHT COMPANY


SECTION
TYPICAL DETAIL No. 1
TYPICAL DETAIL No. 2
SPILLWAY CHUTE DETAIL
CONTRACTOR SHALL REMOVE ALL UNSUITABLE MATERIALS, INCLUDING LOW DENSITY SOILS AND LOOSE BOULDERS, UNDERLYING THE DAM AND REPLACE IN THE ZONE E MATERIAL. DEPTH OF EXCAVATION TO BE DETERMINED IN FIELD ESTIMATED DEPTH OF REMOVAL IS 1.0 FT
CIVIL
SETTLING BASIN
SECTIONS AND DETAILS

COMMENTS OF APPENDIX E OF THE SOUTHWEST ENERGY STUDY REPORT OF THE METEOROLOGY WORK GROUP

HUNTINGTON CANYON GENERATING STATION

The following comments on the subject report have been prepared by the TVA Air Quality Branch staff at the request of D. L. Crandall, Regional Director, Bureau of Reclamation. Most of the comments are directed to sections of the report dealing with the impingement of stack plumes from the Huntington Canyon Generating Station on the adjoining high terrain.

At the outset, we would like to give acknowledgment to the staff of the National Oceanic and Atmospheric Administration (Air Resources Laboratory) who competently prepared the subject report. In our opinion, the report represents a comprehensive and, for the most part, a realistic evaluation of the dispersion climatology in the Colorado River drainage basin, particularly in view of the preliminary nature of the report and the limited time and resources available to the authors. However, we have some questions regarding the authors' concept of the powerplant plume behavior and the resultant ground-level SO_2 concentrations in the Huntington Canyon area. Some of our questions on the local plume behavior are based on such subjective assessment, as our staff has never had the opportunity to visit the plant area and to acquire some onsite appreciation of the complex local dispersion climatology which will largely govern the powerplant plume behavior. On the other hand, our assessment of the estimated SO_2 ground-level concentrations, based on dispersion models, is more objective as we in TVA have had considerable experience in the identification and evaluation of critical powerplant plume behavior patterns and their related effluent ground-level concentrations.

As mentioned previously, we are directing most of our comments to the authors' discussion of plume impingement on the canyon walls and the resultant ground-level SO_2 concentrations. We should also like to emphasize, as do the authors, that the results in this report are preliminary, and that considerably more onsite meteorological and plume observational data will be required before a definitive evaluation of the plume impingement process and the resultant SO_2 concentrations can be prepared.

Our first specific comment is directed to the authors' discussion in the section beginning on page 47 with the reference to the plume impingement process on the canyon walls adjoining the powerplant site and the resultant maximum SO_2 concentrations. We question the assumption that the centerline portion of the plume will impinge directly on the canyon walls, resulting in such high SO_2 concentrations. In 1970 our staff became involved in a limited evaluation of this type plume behavior in connection with a preliminary dispersion climatological evaluation for the Navajo Powerplant area. We attempted to estimate the maximum SO_2 ground-level concentrations in the critical southeast downwind sector of gradual sloping terrain during stable and weak wind conditions. Based primarily on

intuitive judgment, as well as on discussions with the meteorological staff of the Atmospheric Turbulence and Diffusion Laboratory at the Oak Ridge National Laboratory, we concluded that the centerline portion of a stable plume would not normally, if ever, intersect or directly impinge upon this type of sloping terrain. This concept, of course, is contrary to that of the authors as shown in figure 37. We assumed in the Navajo study that the plume would first move downwind horizontally to where the terrain had reduced the effective stack height to perhaps 50 percent or more of the initial effective stack height and then bend slightly upward and continue downwind, more or less paralleling the ground. Thus, the resultant maximum ground-level concentrations would be considerably less than that identified with direct impingement. (Comparative concentrations will be presented later in the discussion.) However, we must again emphasize that our plume configuration concept is strictly subjective, and that it can only be confirmed or refuted by extensive onsite field investigation.

Our next comment is directed to the authors' references to the E. W. Hewson and G. C. Gill (1944) study of the dispersion of plumes from smelters in the Columbia River Valley near Trail, British Columbia, beginning on page 47. The authors make the assumption that maximum SO_2 concentrations would occur along the upper Huntington Canyon walls in a manner similar to those which occurred along the slopes of the Columbia River Valley. It is true that the emissions from the smelters followed the west side of the valley during the early morning hours as a result of the east-west (or cross-valley) wind component during stable downvalley flow. However, we believe the maximum SO_2 concentrations shown by the isopleth pattern along the west side of the valley may be considerably less than the plume centerline concentration due to the horizontal, or lateral, effluent dilution from the east-west wind component and the upslope wind component required to maintain continuity of air motion throughout the respective cross-sectional portion of the valley.

There is also another point in the Hewson and Gill study which needs clarification. The SO_2 measurements were taken by aircraft; and, due to the low-level flying hazard, normally identified with valley terrain, the aircraft probably never approached to within the first hundred feet of the valley sides. Therefore, there is some question regarding the "extrapolated" SO_2 isopleth configuration at the intersection with the sloping surface. We would tend to believe that the maximum isopleth values would be displaced at some minimal distance, perhaps 100 to 200 feet, away from the surface and thereby indicate somewhat lower SO_2 concentrations at the surface. This assumption appears to agree with the authors' referenced statement to the Hewson and Gill study beginning at the bottom of page 47-- "The net effect was that the highest concentration measured in the plume was <u>near</u> the ground along the west wall at which height the valley was about 3 km wide."

We also question the authors' statement on page 48-- "On the basis of these data (discussed in previous paragraph) and from our interpretation

of the constant level balloon trajectory shown in figure 27, it was considered necessary, in the application of the diffusion model, to subtract the height of the terrain from the effective plume rise under stable conditions." It is not clear how the authors can establish a representative wind pattern for the Huntington Canyon site based on a single constant volume balloon trajectory starting at 0811 MST on February 1, 1971. It is also not clear how the rather complex plume configuration accompanying the downvalley-upvalley reversal trajectory (also described by DeMarrais et al. 1968) and the associated maximum ground-level concentrations on the adjacent canyon walls can be appropriately identified with the Gaussian dispersion formulation. With this type condition, the plumes from the powerplant would probably have some initial southeast downvalley component movement in the lower gravitational flow (assuming the plumes did not directly penetrate into the higher elevated upvalley flow) before reversing direction, or shearing, to the north and northwest in the upper flow prior to approaching the canyon walls about 3 km north of the plant. Also, the vertical trajectory in figure 27 shows that the constant volume balloon moved over the terrain with relatively uniform clearance and apparently showed no tendency to impinge upon the canyon walls. This assumption may be justified on the basis of the authors' statement on page 30-- "From the 36th to the 52nd minute, the balloon traveled over the ridges and came within 100 meters of Wild Horse Ridge before turning to the west over the floor of the canyon." Thus, this trajectory would seem to indicate that the centerline portion of the plumes from the Huntington Canyon plant would not impinge on the canyon walls. However, we should reiterate that this assumption is strictly subjective and would require further onsite meteorological and plume observational information for confirmation.

On page 50 the authors indicate that the maximum annual average SO_2 concentrations occur on the east side of the canyon about 3 km north-northeast of the plant. These concentrations are said to occur about 1.3 percent of the time with Pasquill type F inversion conditions and a wind speed of 1.5 mps. It is difficult to envision this type of stable and weak southerly wind from surface to above plume level existing during conditions which we think would tend to be identified with strong downvalley flow. We would very much like to assess the regional and local meteorological features on a typical day when this type of local wind and stability regime occurred. Because of the questionable occurrence of this very stable southerly flow, we would have reservations about the representativeness of the authors' estimated maximum annual average SO_2 concentrations on the canyon slopes 3 km north-northeast of the plant.

With respect to the maximum short-term SO_2 concentrations reported by the authors on pages 52-55, they are in fair agreement with our calculated values. The authors report that the relative 1-hour ground-level SO_2 concentration will have a maximum value of 1.4×10^{-4} sec m^{-3} at 3 km north-northeast of the plant and will occur on the wall of Wild Horse Ridge as a result of the impingement of the slow diffusion plume.

Thus, if SO_2 is emitted at the rate of 375 grams per second, the resultant concentration would be about 25 p.p.m. using a representative station pressure and temperature of 598 mm and 46° F. Our calculations for the same plume dispersion condition show the maximum SO_2 concentrations at the point of assumed impingement to be about 18 p.p.m., or approximately 30 percent smaller than the authors' value. This variance is probably attributable to differences in the data input used, including the standard deviations of effluent concentrations and the ratios for converting peak-to-average concentrations. However, we would assume that the actual maximum concentration would be considerably less than that calculated as, in our opinion, there would be a high probability that direct plume centerline impingement would never occur.

On pages 53-55, the authors discuss the other mechanism (limited layer mixing or trapping) that would maximize SO_2 concentrations within the Huntington Canyon Powerplant area. We disagree somewhat with the authors' estimated maximum relative (1) 1-hour concentration of 1.5×10^{-6} sec m^{-3}, or 0.27 p.p.m. (with SO_2 emission rate 375 grams per second; and representative station pressure and temperature 598 mm and 46° F. for p.p.m. calculation), and (2) 24-hour concentration of 6×10^{-7} sec m^{-3}, or 0.11 p.p.m. Our comparative 1-hour and 24-hour calculated concentrations are about 0.05 and 0.008 p.p.m., respectively; the former being about 5 times and the latter about 14 times smaller than the authors' values.